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Is Prosperity Here To Stay?

By K. H. Condit
Editor, *American Machinist*

An analysis of the business and industrial situation and a look ahead into 1926 and what it portends at home and abroad

HARD is the road of the business forecaster. By dint of much study and analysis he works out sequences of economic events and congratulates himself that at last the confused bustle of business life has been reduced to its basic principles. He sets up certain weathervanes to indicate the direction of business currents as, for instance, that industrial activity will follow the course of the stock market, up or down, at an interval of six months. Or, that the interest rates on commercial paper are sure indicators of what general business is going to do.

Then, sad to say, from the forecaster's point of view, up rise such disturbers of old customs as the Federal Reserve Board and Herbert Hoover. The Federal Reserve Board with its autocratic control of the rediscount rate can upset completely the old sequence of economic events.

Mr. Hoover's activities, although along different lines, are equally destructive of traditional ideas. His unremitting endeavors to persuade business men to study their problems and to avoid speculative ventures with insufficient knowledge of the economic facts they ought to have, have had a profund effect on the fluctuations of the business cycle. It is too much to hope, of course, that the wide swings from boom to depression have been done away with, for men will forget to think and will act on "hunches," but it is fair to say that amplitude of swing of the cycle curve will diminish as business men generally learn more about economic principles and find means of getting the statistics they need on production and distribution.

General situation is sound

What of the general situation? Holders of the business cycle theory seem to agree that the present cycle has reached the prosperity stage. Such being the case, some of them are beginning to sound warnings against commitments too far ahead. Tangible evidence that a period of liquidation is imminent are scarce unless one reasons that the bull market in stocks, the speculation in real estate and the enlarged capacity of automobile plants must lead to reaction.

Set against these factors the favorable position of the railroads, the small inventories of most kinds of goods in retailers' hands, the improved condition of the farmer and the fact that a good many manufacturers have not reached anything resembling capacity operations and the picture is much brighter.

No portrayal of general business conditions would be complete without some statement of international relations and conditions in other lands. Most encouraging to business men and industrialists everywhere are the conclusion of the Locarno treaty and the progress made in the return to a gold basis. Mention must also be made of the debt funding settlements by eleven countries through which over seven billions of the outstanding war debts owed to the United States will be paid back eventually. Most of the balance is owed by France and it must be admitted that conditions in that country are unpromising.

French political situation is unpromising

It is becoming increasingly apparent that no political party in France can enlist sufficient support to put over a taxation plan that will balance the French budget and save the franc from going the way of the mark. In the meantime the depressed currency has given an artificial stimulus to French trade. There has been no unemployment and the trade balance has been favorable. France's dependence on the outside world for raw materials is beginning to have its effect, however, for the supply on which her industries have been living for some time is nearing exhaustion and it will consequently be necessary to purchase new supplies from countries with uninflated currencies. The whole situation is so involved with politics that the future is obscured.

Great Britain has been on a gold basis since April and while many of her economic troubles are behind her, she still has a pressing unemployment problem and faces reduction in her exports because of the falling off in the demand for coal. In what are known as the engineering trades the profound depression that has enveloped them so long is beginning to lift, particularly in the automobile and electrical industries and with the equipment makers that supply them.

Conditions in Germany seem to be improving although there is a serious shortage of capital resulting from the devaluation of the old currency. Interest rates are consequently very high and the financing of

export trade is correspondingly difficult. Italy is suffering from an inflated currency but she has a budget that appears to be permanently balanced and is making steady progress industrially. In the mechanical field she is ahead of pre-war production and textiles are in good shape. Unemployment is diminishing rapidly even in the face of reduced emigration occasioned by restrictions of other countries.

Business is on the upgrade in Norway, Sweden and Denmark although these countries have been going through the usual troubles attendant upon a return of currency to a gold basis. Conditions in Switzerland and the Netherlands seem to fall in the "fairly satisfactory" class.

According to all reports Czecho-Slovakia is enjoying a degree of prosperity quite above anything else on the continent. She has a very favorable trade balance and a stabilized currency. Austria and Poland are both victims of scarce capital and high interest rates. Austria has a stabilized currency while Poland has not. Unemployment is acute in both countries.

Of Russia little can be said. This much seems to be true, however—that the socialization of agriculture has failed and the peasants are exerting increasing pressure on the government to admit foreign products at a price that puts them within reach. Signs are not wanting that a new despotism, differing only from the old regime in that commissars will replace dukes and barons, will be the government of Russia.

Japan has suffered from fires and earthquakes but conditions are fair and getting better. It is not far from the truth to say that chaos reigns in China. As a result the Far East is the only part of the world where United States exports fell off. South America, on the other hand, took a larger proportion, consisting mostly of manufactured goods, and should prove an important market in the future.

Real wages high in the United States

And now to come home to the United States. The year just closing was marked by the highest standards of living in history. Real wages as measured by relative index numbers of wage rates and commodity prices have been higher, a statement that is borne out by the great increase in savings deposits. Retail trade reached the highest figure on record. Building construction and automobile production were exceptionally active. The greatest volume of railroad traffic in history was handled more efficiently than ever before. Unemployment has been practically negligible except in the mining industry.

This record certainly sounds like prosperity. Can we expect it to continue, and for how long?

Let us consider some of the more important fields. The automobile industry seems to have settled down to an annual production of somewhere around 4,000,000 units. Competition on a price basis is constantly sharpening and as a consequence production methods and equipment are steadily being revised and improved. The bus field is developing rapidly and seems to have great possibilities. Impending legislation will have a stimulating effect on commercial aviation which is likely to move ahead much faster in 1926. Export business is growing steadily for the passenger car and truck builders. There is a danger of overproduction of passenger cars but the strong financial position of the important companies and the sound management of most of them are likely to prevent any serious consequences.

Electrical goods manufacturers are looking forward to the best year ever. Generating capacity is increasing at a stupendous rate, new applications of electric power are constantly developing and the public is being educated to better lighting standards and wider use of electric labor-saving equipment. Research is likely to be an important factor in this field as well as in the automotive field. The development of the household refrigerator promises to parallel that of the automobile.

Railroads should buy more in 1926

Railroad purchases during 1925 both of rolling stock and maintenance equipment were rather less than expected. With the present favorable earnings situation most roads should buy more cars, locomotives and shop equipment during 1925. Several major electrification projects are under way and the announcement of others may be expected during 1926. Oil-electric locomotives, several of which have performed satisfactorily in recent months, are likely to come into much wider use in the very near future. Motor railcars of various types have also arrived and it is probable that many will be ordered for branch lines during the next year.

Printing-press builders are in general running at capacity. As some of them have orders as much as two years ahead they should continue to do so. The textile machinery companies, on the other hand, have suffered from the dullness of the textile industry. They will undoubtedly do better in 1926.

Manufacturers of typewriters, adding machines and other mechanical office equipment are busy when general business is good. Their activity for 1926 should therefore follow the general business curve which promises to remain at a high level.

Builders of machine tools are busier than they have been in five years. The curve of orders has risen steadily for a year and a half and should continue to rise although the rate of increase will diminish. The so-called standard tools are not as active as the ones designed for high-production manufacturing but many builders of standard tools report a satisfactory volume of business, all things considered.

Machine-tool business should be good

There is every reason to believe that 1926 will provide as much machine tool business as 1925. With the curve at its present high point we may see fluctuations of some importance but at present there is nothing to indicate a reversal of direction. A favorable factor is the completion of the disposal of surplus war stocks.

Agricultural machinery markets are active when the farmers are prosperous. They have improved rapidly during 1925 and should continue to improve during 1926, assuming continued prosperity for the farmer, a fair assumption from present indications.

The continuance of prosperity is very largely in our own hands. If we will curb speculation and be satisfied with a fair return for our work, support basic research and apply simplification of size and specification wherever possible, study our production and distribution costs and do our best to help our less fortunate brothers in other countries back onto their feet, there is no reason why prosperity cannot be the standard condition of affairs.

Examples of Heavy Sheet Steel Drawing

Advantage taken of tendency of metal to thicken up—Shells produced having wide variation in thickness of wall—Drawing steel that is more than ¼ inch thick

By Ellsworth Sheldon
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THE Rockwood Sprinkler Co. of Worcester, Mass., has in the last decade achieved some remarkable results in the way of drawing heavy sheet metal. Beginning before the war period in a successful endeavor to substitute shells of drawn steel for iron castings from which to make the pipe unions, couplings, etc., that are a part of its regular product in the business of supplying sprinkler systems for factory and other buildings, this company has adapted the process of press drawing to the production of many standard and special parts that were hitherto obtainable only from castings or bar stock by way of the screw machine.

If a part that will meet all requirements in the way of strength, rigidity, etc., can be made from a single piece of sheet metal, and it is possible to devise means and design tools by which it can be produced in a press operation or series of operations, there remains only the factor of a market for the product sufficient to warrant the tool cost to insure its success; for in no other practical way yet devised can a part be made that involves so little waste of material, so few after-operations, nor one that is so strong in proportion to its weight.

The shell shown in its successive stages in Fig. 1 was designed to take the place of a screw machine product. Though it is a munition of war, demanded by the government in large quantities during the war period, it is of present interest as an example of what can be accomplished in the way of working heavy sheet metal, in that it points the way to the application of press drawing methods to more peaceful and profitable lines of endeavor.

The length of this shell is 4⅜ in. The cylindrical portion is a trifle more than 1 in. in diameter at its smallest part and the thickness of wall is 0.0625 in. at this point. At the large end the wall thickness has been increased to nearly ½ in., yet the entire shell is made of a single piece of sheet metal. The heavy shoulder is threaded—in a later operation—to follow a 1¼-in. pipe tap, while the flange is made hexagonal so that the part may be screwed in place with a wrench. The tolerances in respect to diameters and thickness of wall are 0.001 in. plus or minus, and are correspondingly close in other respects.

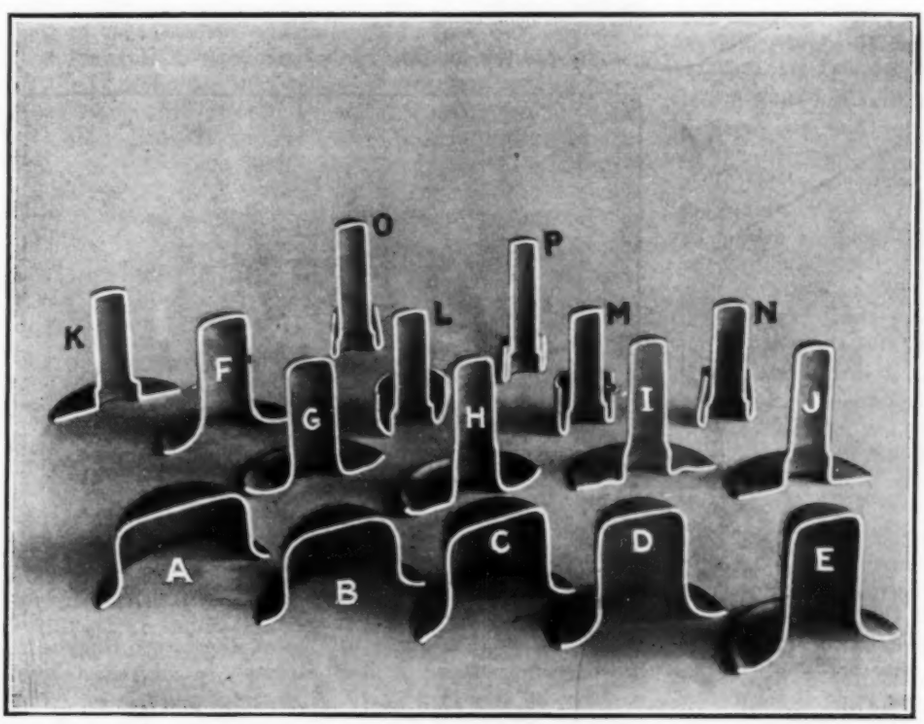


Fig. 1.—Successive operations in producing a shell

It had been made from bar stock on a screw machine, with a percentage of rejection from defective stock, lack of concentricity, variations in wall thickness and other causes, that in view of the enormous quantity demanded was truly appalling. The productive capacity of available screw machines was far below the requirements, no new screw machine equipment could be produced in time to meet the emergency, and the demand was urgent in the extreme. After a few standard drawing presses had been put in operation the output capacity of the plant rose to 50,000 pieces per day of 24 hours.

The material used in its manufacture was cold rolled drawing steel of 0.109-in. gage. The tools required were simple in form and, after the engineers of the company had found out how to design them, not difficult to make. There were 17 press drawing operations and, except for the cutting of the pipe thread on the tapered shoulder, no machining operations. The methods of production were worked out and the tools designed under the supervision of Hjalmar G. Carlson, superintendent of the Rockwood plant.

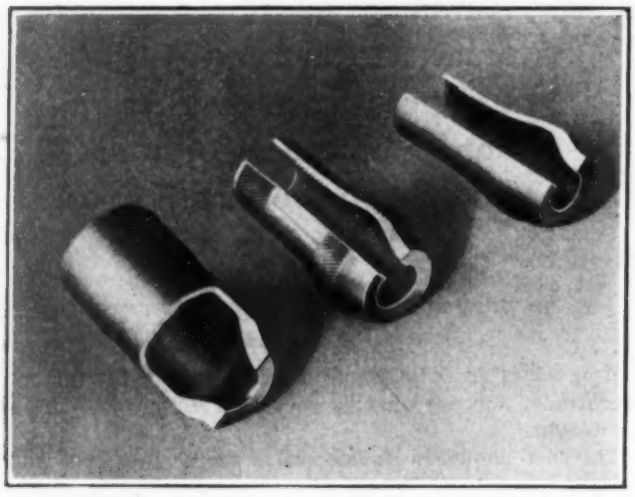


Fig. 2—Sleeve for the chuck of a bit-brace

The first operation was to blank from the strip and draw to the shape shown at *A*, an operation that was performed under the usual form of double-action press. Shells *B*, *C*, *D*, *E*, *F* and *G* represent simple redrawing operations in which the piece is pushed into a round die by a formed punch and ejected by a knock-out attachment. The flange has not at any time been confined or struck by the punch during the operations, but the consecutive reduction in diameter has thickened the metal of which it is composed to 0.125-in. and caused it to curl slightly near the outer edge.

The operation on sample *H* is similar to the preceding ones, differing only in the fact that the shell is not pushed so far into the die and is thus left with a slight shoulder, as may be seen in the illustration. In the next operation, sample *I*, the shell is carried clear into the die (which, with the punch, is of two diameters to correspond) and at this time the flange is struck by the recessed shoulder of the punch, flattening out the curl at the edge and causing the excess metal to flow toward the center in a sort of wave that may be seen surrounding the central portion of the shell.

Between this and the succeeding operation, which is shown at *J*, the flange has been trimmed to a definite diameter in an intermediate operation which we have not included here as it does not change the shape of the shell. A plain round blanking die is used, and the punch has a pilot that is partly fitted to the interior of the shell to center it over the die.

The die to produce sample *J* is made with a recess—like a set-edge—in its upper surface, this recess corresponding in diameter to that of the trimmed flange. The punch has a short pilot shaped to the interior of the shell and a shoulder that fits the recess of the die. When the flange is struck by these tools the wave of metal is flattened out, and as the perimeter of the flange is confined by the recess in the die the excess metal in the wave can flow only in toward the center.

In this manner the inner corner is brought up almost sharp—an operation sometimes called "selvedging"—as the metal, being wholly confined between the unyielding surfaces of the die and punch, has no place to go other than into the corner. The next operation, sample *K*, is similar in character, the corners of the shoulder on the diameter of the shell being sharpened at this stage.

All of the foregoing operations are performed with the closed end of the shell down. In the two operations next succeeding, *L* and *M*, the piece is turned the other end up and pushed through dies to fold the flange along the central, or barrel, portion of the shell. The first punch is hollowed out to fit over the shell and shaped to match the entire contour as it appears after the operation. The second punch also encloses the barrel of the shell but stops short of the edge of the upturned flange.

Both of these operations, as well as operation *N*, shorten the perimeter of the flange and cause the metal to thicken up considerably. In operation *N* the shell is pushed into a tapered die to fold the upturned flange still closer to the barrel. The difficulty experienced at this stage is mostly to make a die that is strong enough to resist the bursting strain caused by pushing the tapered shell into it. Operation *O* is a partial redraw in which the upper portion of the barrel is reduced to its final thickness.

Operation *P* is distinctly one of swaging, and requires a very heavy press. The die is made up of three separate parts, all being forced into a ring of tempered steel to re-enforce them against the enormous pressure required to swage the cold metal into place. The opening in the lower member of the die corresponds in size and shape to the cylindrical portion of the shell. The middle member is tapered to correspond to the draft of the pipe thread that is to be cut on the shoulder. The upper member is hexagon in shape to form the flange for the wrench.

Though the wall of the finished piece *O*, up to the shoulder at the leading end of the pipe thread, is composed of two thicknesses of metal, the outer thickness has been flowed and molded so closely to conform to the contour of the inner part that only a close scrutiny under a glass will disclose the junction. The wall at this point is nearly $\frac{1}{8}$ in. thick.

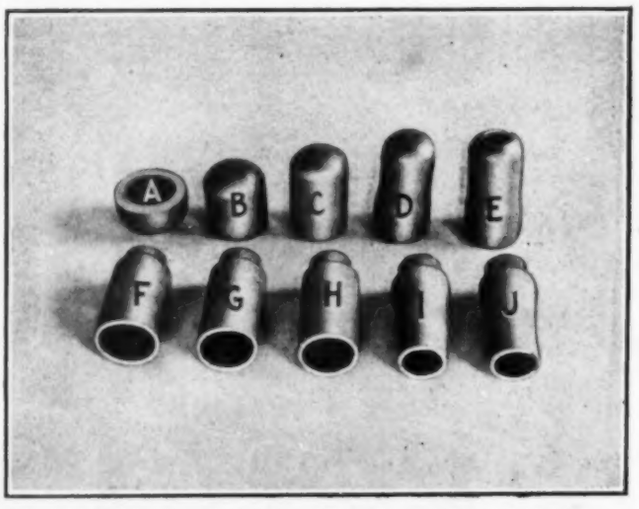


Fig. 3—Sequence of operations to produce the sleeve

That the shells made by this method are superior to those made upon the screw machine has been proven by exhaustive tests. That the inner and outer contours must be concentric and the structure of the wall of greater uniformity than could be produced by any

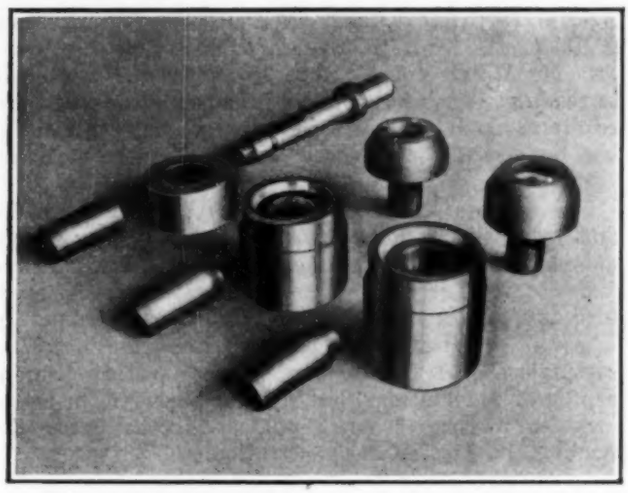


Fig. 4—Tools used for some of the operations

other method should be obvious to anyone at all familiar with press work. The foregoing process is patented.

Turning from the grim demands of war to more peaceful pursuits, we have the part shown in Fig. 2, which is the sleeve of the chuck for a bit-brace. This, also, had previously been made on a screw machine, but by the adaptation of patented press-drawing methods its cost is greatly lessened while at the same time its strength and uniformity of structure is enhanced. The only machine operations are threading, knurling and squaring the ends.

The metal from which this part is made is hot rolled steel, 0.280 in. thick. It is blanked from the strip and cupped as at *A* in Fig. 3 with the usual form of blank and draw tools. In drawing heavy stock the importance of the blankholder diminishes as the thickness of stock increases, and in this case no blankholder is used, though the blanking punch is made in the same way as the usual combined blankholder and punch and is used in the regular blankholder slide of a double-action press.

In working stock of this thickness it is necessary to anneal after nearly every operation. The shells are annealed, pickled, allowed to rust slightly and then rolled in tallow. It is claimed that the combination of oxide and tallow makes an ideal lubricant for the drawing operations that follow.

Operations *B* and *C* are plain push-through redraws in which the diameter of the shell is reduced but a small amount, the prime object being rather to reduce the thickness of wall. The shape of the end of the punch is such, however, that there is no reduction in wall thickness near the end of the shell where the extra thickness is wanted in the finished piece.

Observation of the split shell in Fig. 2 will show that there are two places where extra thickness of wall is required; at the lower end where the sleeve is to close over the jaws of the bit-brace, and near the upper end where the thread is to be cut. The metal for the first comes from the thick end of the shell; that for the thread is flowed into place by a series of operations that has its beginning in shell *D*, and is most unusual and interesting.

The punch and die with which the transfer of stock is begun are shown to the left in Fig. 4, together with a shell as it appears after the operation. The die is a plain ring of steel, differing in no respect from the average redraw die. The punch, however, presents a peculiarity in that it is of larger diameter at the end than elsewhere, the back shoulder being smoothly rounded and blended into the smaller diameter.

When the shell *C*, Fig. 3, is pushed through the die to form it as at *D* the metal of the wall is thinned out where it surrounds the larger diameter of the punch but retains its original thickness above that point and is molded around the smaller diameter; the result being that when the shell emerges from below the die it is of uniform diameter outside but of two diameters inside, the smaller above the larger.

This would seem to be a piece impossible to strip from the punch, but the stripper shown in Fig. 5 accomplishes it very easily. The stripper is one of many of this type that are used in this shop. It goes into the die-bed below the die, the latter in fact resting upon it. The radial grooves in which the tempered steel fingers slide, are of sufficient depth relative to the thickness of the fingers so that the latter may move radially without restraint but are strictly confined against a movement in other than a radial direction.

The upper corners at the inner ends of the fingers are rounded, so that when a shell, in passing through the die, strikes them, the fingers are pushed back against the tension of the flat springs, but when the shell has passed through them the fingers are snapped back by the springs to rest against the punch above the shell. On the return movement of the punch the upper edge of the shell is engaged by the fingers and it can rise no further; either the shell must strip from the punch or something will break, and it is only a matter of experiment to determine which will happen.

The peculiar feature of this operation takes place during the withdrawal of the punch, being in itself a drawing operation with the parts reversed. The shell, engaged by the fingers of the stripper, cannot come back through the die, so the enlarged end of the punch

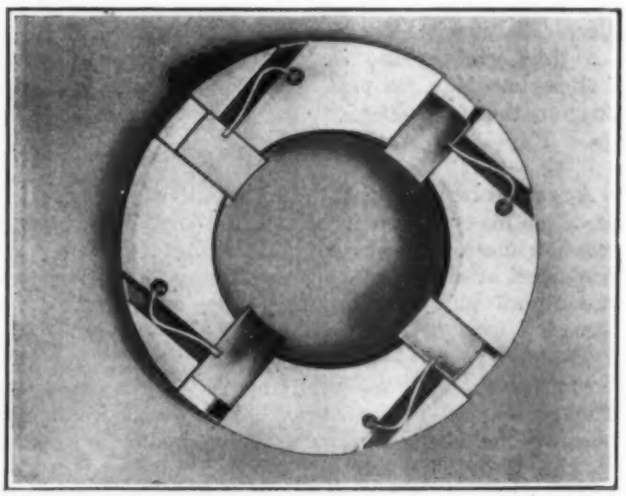


Fig. 5—Stripper for heavy shells

is necessarily drawn out through the smaller diameter of the shell, causing the metal to swell outward as may be seen at *D* in Fig. 3 and leaving the shell with a uniform diameter inside and two diameters outside; the difference being the difference in thickness of wall.

The excess metal is wanted, however, on the inside, and to get it there the shell *D* is once more passed through a die by a punch that is parallel and of the smaller diameter. Before this is done the end of the shell is pierced out as at *E*, the operation being done at this time for the reason that the shell does not again present a uniform diameter inside.

The transfer of metal from outside to inside is accomplished in operation *F*, which is also the first of the "necking" operations by which that end of the shell is closed in and the metal still further thickened. Operations *G* and *H* are repetitions of the necking process by which the shell is reduced to the final shape at this

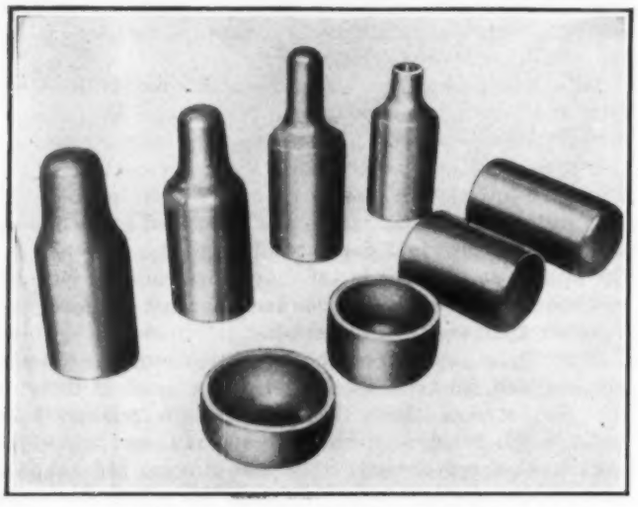


Fig. 6—An example of necking

end. In the second of these operations the wall is thinned out somewhat above the point where the thread is to be cut.

In Fig. 4 may be seen the dies and punches by which operations *I* and *J* are performed. These are also "necking" operations, and serve to close in the shell to its final shape, at the same time causing the wall to be thickened. The shells are inverted from their position in preceding operations and the work is all done by the dies. The punches are shaped to match the contour of the thick end of the shell so as not to cause distortion but take no part in the work except as the medium through which the pressure is applied.

An Example of Necking

A good example of the application of the necking principle may be seen in Fig. 6, the shell being a very common machine part that has heretofore been made from bar stock. The only machining operations are cutting off and squaring the ends, and tapping the thread.

The first four operations are ordinary drawings, the first being the only one requiring a double action press. The succeeding operations are performed by merely pushing the shell into sucessively smaller dies with punches that fit the skirt end but are sufficiently smaller at the other end to allow for the flow of metal toward the center. Frequent annealings are necessary and presses of ample power are needed, but the tools and the operations are extremely simple.

This shell is made from 0.187 in. hot rolled steel. The skirt remains at the original thickness throughout, but the small neck is thickened up to nearly $\frac{3}{8}$ in.

A Comparison of Methods for Testing Hardness —Correction

IN THE article, "A Comparison of Methods for Testing Hardness," by H. E. Degler, published in the *American Machinist*, Vol. 63, page 381, reference was made to readings obtained upon the Rockwell hardness tester, readings which, it is pointed out here, may be misleading, because of the erroneous use of Rockwell hardness symbols.

The range of the Rockwell C-scale is from 0 to 100, and readings on the C-scale are obtained by using a diamond cone as the testing point and 150 kg. as the major load. The range of the Rockwell B-scale is from 0 to 100, and readings on the B-scale are obtained by using a $\frac{1}{16}$-in. ball as the testing point and 100 kg. as the major load. The readings on both scales represent depths of indentations, but the numbering is in retrogression for progressive depth, so that the lower the reading the greater the penetration.

Not True Readings

The reading C-0 means a depth of impression of 0.008 in., and the machine is not calibrated to give readings for greater penetration, nor is the penetrator ground to be used for greater depths. For materials softer than C-0, readings on the Rockwell tester are intended to be taken on the B-scale, that is, using in the instrument the $\frac{1}{16}$-in. ball and a major load of 100 kg. In Mr. Degler's experiments, the conical diamond penetrator was used for metals softer than those that would give a reading of C-0. The readings given in the chart and table that are a part of the article are not, therefore, true Rockwell readings.

How the readings given, and erroneously called "Rockwell Hardness Number 'C' Scale," were obtained, is explained by the following quotation taken from the article:

"The Rockwell hardness tester, with a diamond cone point and the C-scale can be used for comparing soft materials with harder materials providing that the total number of divisions over which the pointer moves from its initial to final position is observed. This reading indicates the depth of impression of the diamond point. If the readings are substracted from 100, the C-scale Rockwell numbers are obtained, and on the ordinary Rockwell dial this subtraction is taken care of automatically, except in cases where the pointer makes more than one revolution. In these tests the pointer moved more than one revolution and the Rockwell C numbers were obtained by subtracting from 200."

In view of the facts that the hardness tester was not designed to permit the use of the diamond cone penetrator with metals that will give a reading below C-0; that a ball, with which a different weight is used, is provided for testing the softer metals; and that the Rockwell C- and B-scales have been established with definite limits; it is considered that this further explanation is advisable to prevent misunderstanding of the instrument and of its use.

The table given in Mr. Degler's article should not be used as a conversion table, because, as has been pointed out, the column headed "Rockwell Hardness Number, 'C'-Scale," does not list true Rockwell readings as they are ordinarily understood, and as they would be obtained by following the Rockwell method of testing.

Making Elevator Units in the Otis Plant

By Frank W. Curtis
Associate Editor, *American Machinist*

Type of trunnion drill jig used for various parts—Procedure followed in producing laminations—Details of dies used—Special burring machine—Slotting a large armature spider

THERE is such a variety of parts in the construction of an elevator unit, which require drilling from two or more sides, that it is necessary to provide trunnion drill-jigs to handle the work. For this reason, the Otis Elevator Company, in its Yonkers, N. Y., plant, has standardized the construction of trunnion jigs as far as possible, including such parts as the base, trunnions, index-locking pin, jig leaf, jig latch and other parts used in their construction. Throughout the shop, for both large and small work, a close resemblance may be seen in this type of tool.

In some cases it is necessary to drill work from more than four sides, therefore requiring a jig of the double-trunnion type. This form of jig also carries the same standardized parts in its make-up. An example of one of these jigs is shown in Fig. 10. The work *A* is a stator frame, requiring drilling from six sides. The jig is located on the base of a Cincinnati-Bickford radial drill, it not being necessary to bolt or clamp the jig to the machine due to its weight. A quick-change chuck is used to accommodate the various drills and taps that are used in carrying out the operation.

Further details of the construction of the jig are shown in Fig. 11. The jig comprises a base *B* and two trunnions *C* and *D* mounted on it. These trunnions pivot the outer jig-frame *E* as shown at *F*. The jig frame in turn pivots the jig body *G* that holds the work. The four bearings on which the units swing are provided with hardened steel bushings as at *H* that are ground to a running fit in the corresponding frame castings. The work is located on a pilot *J* which fits the large bore of the work that previously has been machined, and three hardened-steel blocks *K* that locate the circular face of the work. An equalizing clamp *L* then is tightened against the feet of the work so as to insure the proper radial position. The jig leaf *M* is locked in position by the jig latch shown at *N*. The T-bolt is turned by means of the pin *O* so it passes the slot in the jig body *P* when being closed after which it is turned to the position shown. The handknob *Q* then is turned to lock the leaf. On the jig leaf are mounted three screws *R* that are tightened to hold the work against the locating blocks. Spring plungers, such as shown at *S*, are used to lock the jig frame or body in the desired position. The pin *T* is mounted on the pull handle *U* so it is withdrawn when the latter is turned as shown dotted at *V*. A spring *W* is used to force the pin into the locating bushing *X* when the handle is returned. The end of the pin is provided with a slight taper to correspond with that of the bushing, insuring an accurate index.

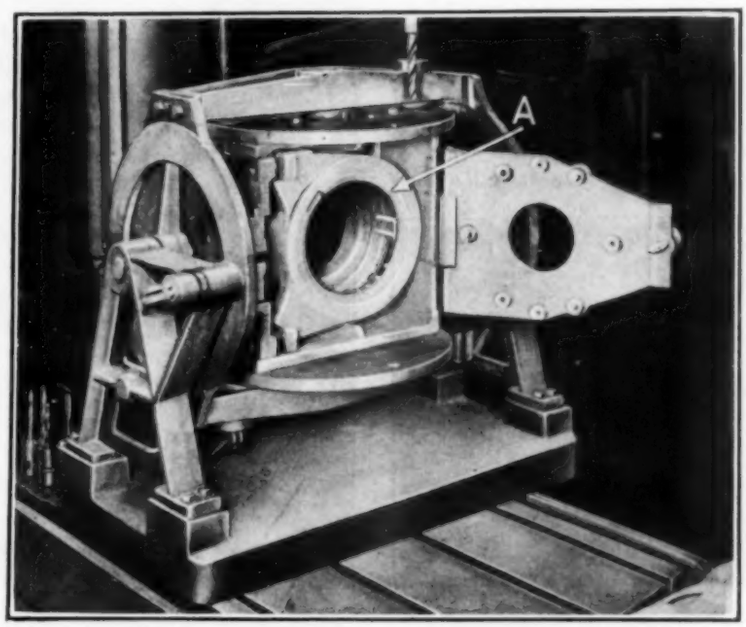


Fig. 10—Trunnion drill jig for stator frames

The forming, piercing and trimming of terminals is handled on a V. & O. press shown in Fig. 12. Copper tubing is first cut to length and chamfered on one end prior to this operation. A circular fixture *A*, provided with 26 locating pins *B*

The conclusion of the article. The first part appeared on p. 999.

that hold the work *C*, is used, the indexing of which is operated by the stroke of the machine. The tube is formed or flattened out at the right-hand side of the die and then indexed to the next station that pierces the hole and trims the outer edge. A finished terminal is shown at *D*. The locating pins that hold the tubes are withdrawn by means of a cam *E* that strikes the roller *G* permitting the finished pieces to drop down into a tote-box located on the floor. The press operates at 60 strokes per minute completing a unit at each stroke. The tube is $\frac{1}{2}$ in. in diameter, $\frac{1}{16}$ in. thick, $2\frac{1}{4}$ in. in length and pierced to $\frac{13}{32}$ inch.

Stamping Laminations

Laminations, used in the building of various sized motors, are blanked from large plates starting with the larger diameter blanks from which the succeeding sizes are made from the center pieces. Fig. 13 shows the die for making the laminations blank *A* from the piece at *B*. In Fig. 14 is shown a similar die that makes the blank *A* from the center portion *B* that is produced from the operation shown in Fig. 13. In Fig. 15 is shown a variety of the sizes made.

At *A* is the first blank, 22 in. in diameter, provided with three locating holes *B*. The notching is then made as at *C*, being a series of small rectangular pieces punched from the center portion, after which the work is blanked as shown at *D*, forming the lamination *E*. The center section then is blanked as shown at *G* and notched as at *H*, leaving a $10\frac{1}{2}$-in. diameter piece that is finished to the sizes shown at *K* and *M*. The notching of one of the larger laminations is shown in Fig. 16. A Zeh & Hahnemann machine is used, on which the work is located by the center hole and one of the inside holes.

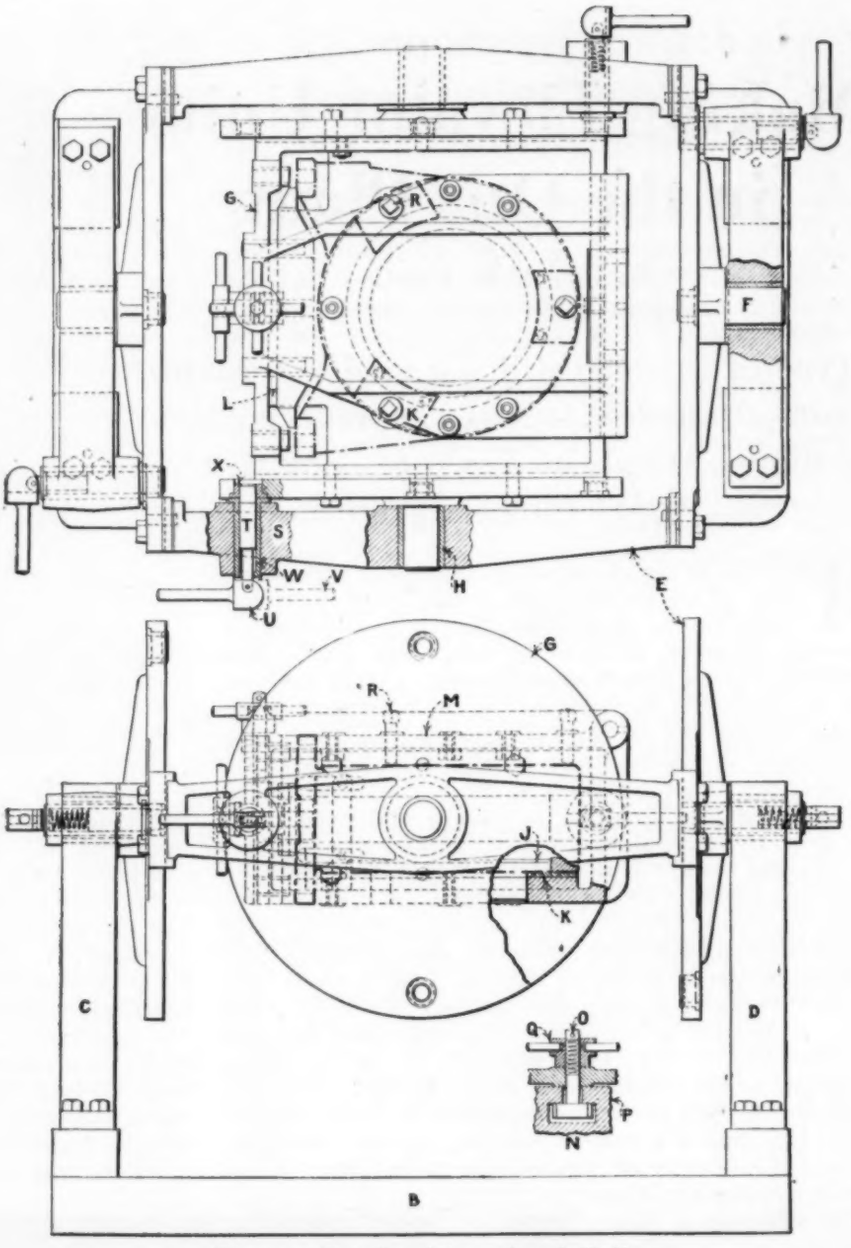


Fig. 11—Details of trunnion drill jig

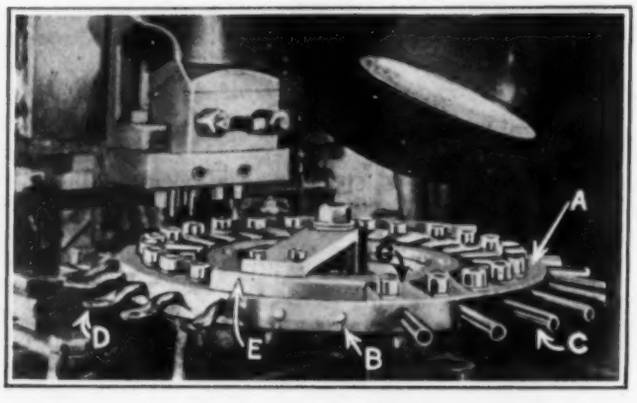
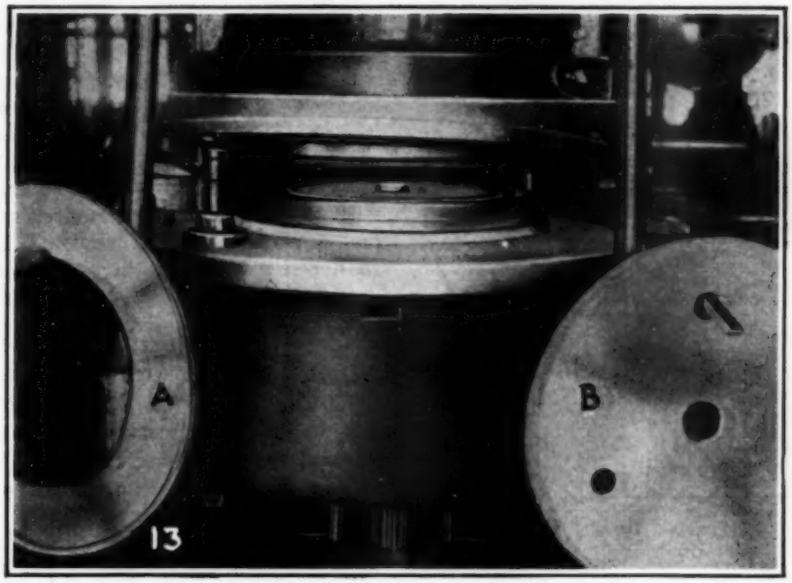
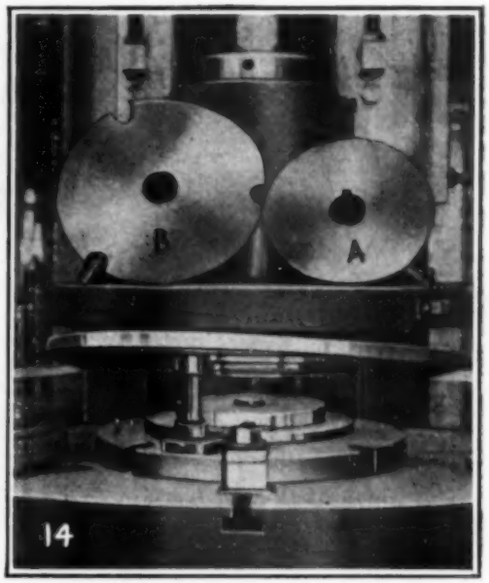


Fig. 12—Index fixture and die for forming and piercing terminals

There are 96 notches perforated at the rate of 240 strokes per minute. The clamp *A* that bears against the work is operated by the cam-handle *B* in the top of the arm.

A layout of the punch and die for the $8\frac{1}{2}$-in. armature lamination is shown in Fig. 19. The die *A*, fastened to the punch holder *B*, has a stripper plate *C* that receives its pressure from four springs *D*. The outward position of the plate is limited by four stripper studs *E*. The punch *G*, located in the die block *H*, has a pressure pad *K* located around its outer edge that is mounted similar to the stripper plate. A smaller punch at *L* is used for punching the center hole of the work, the corresponding die being located in the large punch *G*. A detailed view of the stripper stud is shown at *M*. By loosening the taper-headed screw *N*, the threaded collar *O* can be adjusted in either direction to compensate for the height of the die *A* as it is face-ground for sharpening. A similar adjustment is applied to the pressure pad. At *P* is shown the method of mounting





Figs. 13 and 14—Two of the dies used for punching armature laminations

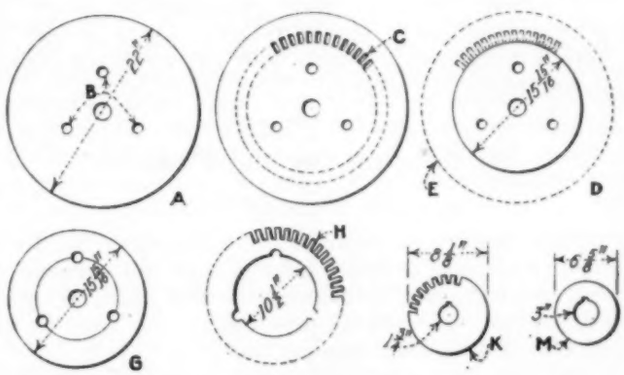


Fig. 15—Details of the procedure used in making laminations

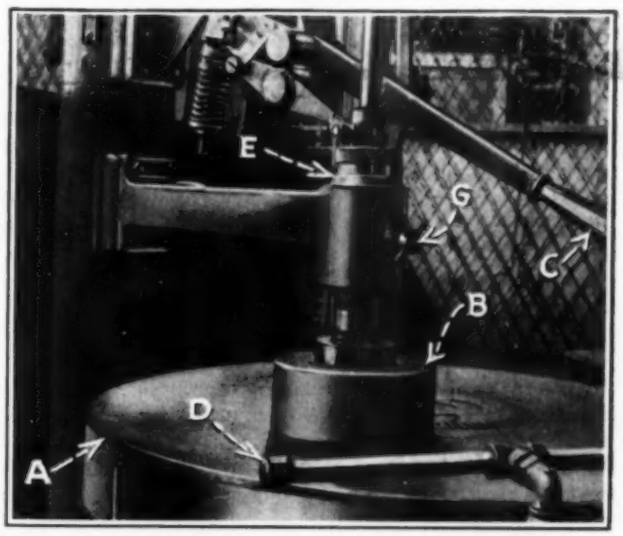


Fig. 17—Special machine for burring laminations

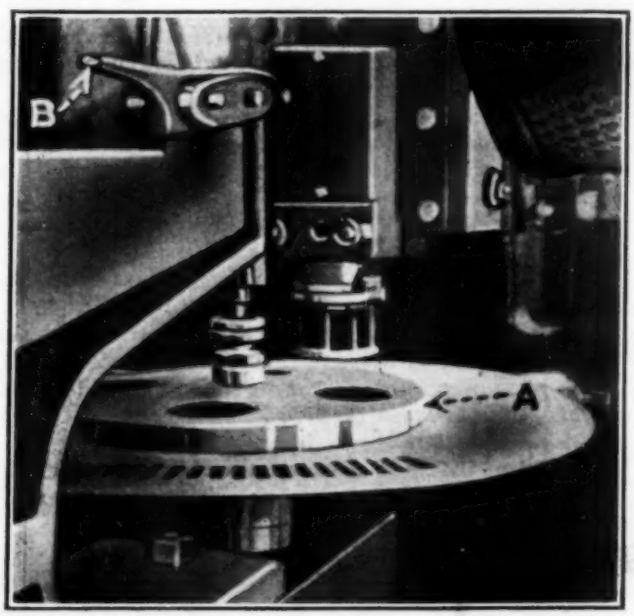


Fig. 16—Notching one of the larger laminations at the rate of 240 strokes per minute

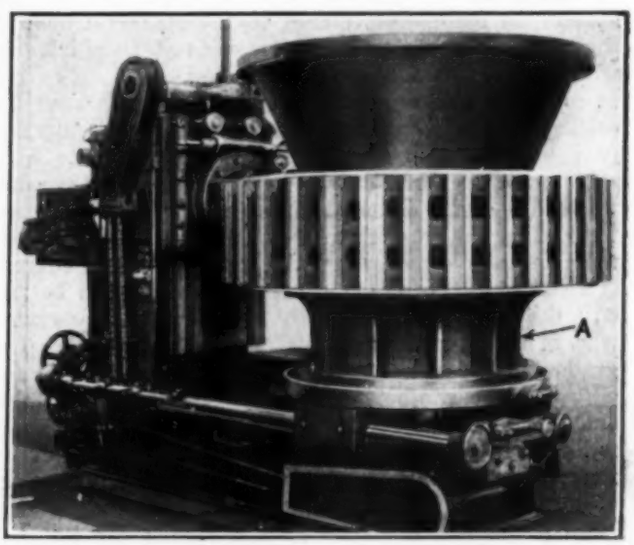


Fig. 18—Slotting a large armature spider on a gear-cutting machine

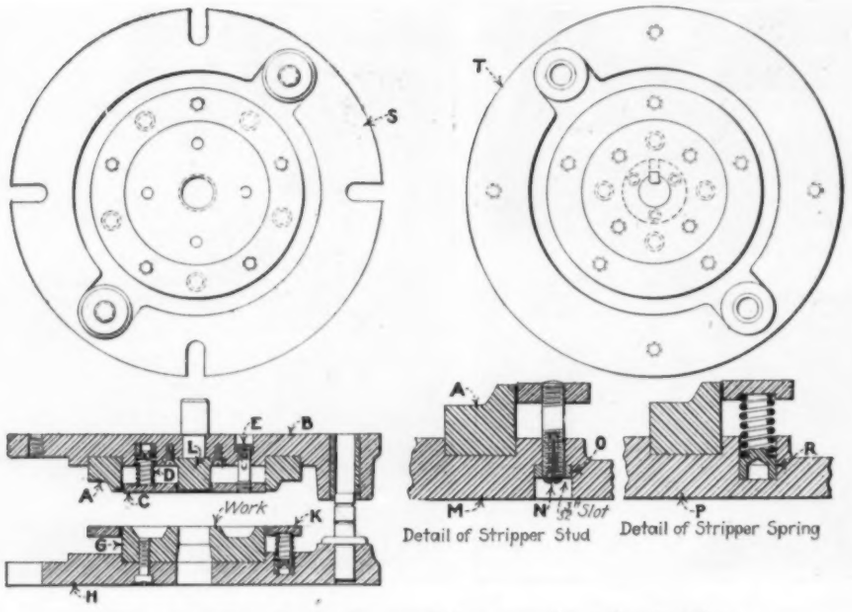


Fig. 19—Details of die used for punching laminations

the coil springs. In order to equalize the pressure on the stripper plate when the die has been ground off $\frac{1}{2}$ in. or more, a spacer *R* is used in the bottom of the hole and can be changed when necessary. The spacers are made in sizes ranging from $\frac{1}{2}$ to 1 in. high and carried in stock for use on all dies using stripper plates and pressure pads. At *S* is shown the plan view of the die block and at *T* the plan view of the punch holder, both of which show the arrangement of screws, springs and pins. The layout offers a good example of a punch and die for this class of work.

In order to eliminate core losses, which are generally the result of laminations being slightly separated due to burrs produced in punching or being damaged in handling, it is necessary to burr or stone one side of the laminations. The operation was generally done by hand, using pieces of obsolete abrasive wheels. This method required so much hand work that the company built the special machine shown in Fig. 17, with the result that it has greatly reduced the labor cost of the operation and produces a better product, more evenly stoned. A lamination, placed on the magnetic table *A* that revolves at a slow speed, travels under the burring wheel *B* that also operates at a slow speed so as not to cause a grinding action. The handle *C* is used for oscillating the wheel over the work so that only one pass or revolution is required to clean off the high spots. Air pressure, operated by a treadle and passing through a series of small holes in the pipe *D*, is used for raising the work from the table at a predetermined point of table travel when the magnetic-chuck current is released. The action causes the lamination to "fly off" the table so it is easily caught by the operator who in turn immediately places on a new piece. The graduated collar *E* located on the spindle is used for adjusting the gap between the wheel face and the table and to compensate for wear of the wheel. The spindle is locked in position by the screw *G* that clamps on an inner plate, preventing the spindle from becoming out of adjustment. The use of the machine for burring laminations has made possible a longer life between grinds of the dies used for blanking and notching since the presence of a slightly burred edge produced by the dies does not necessitate immediate grinding as was required before the burring machine was installed.

An example of large-size work handled by the company is shown in Fig. 18, the operation being that of milling slots in an armature spider of a furnace-hoist motor. The work is 72 in. in diameter and has 33 slots, 17¾ in. in length, $\frac{1}{4}$ in. in depth and finish to a width of 2±0.001 in., milled as shown. Rough and finish cuts are taken, using plain milling cutters of standard design. The lower section *A* is the fixture used for locating and holding the work. Armature laminations are fitted into the finished slots, necessitating evenly spaced slots, accurate to size.

The tools and methods described in this article have had great influence in producing parts that are accurate, as well as in producing them at low cost. They demonstrate that there are many opportunities where ingenuity in design of tool or fixture is likely to spell the difference between a smooth flow and costly irregularities of goods in process.

Bidding for the Profit

By R. B. Willis

Some time ago a contributor to *American Machinist* told us of some of the difficulties and sad experiences that had been gone through on the way from "We want the job" to "We want the profit on the job," and we are all glad that someone has got there.

For many it is not so simple. Complications set in when business is dull. Bidding for a sure profit may not get us anywhere except to a shut-down, if the other fellow is anxious to keep going and to protect his investment in money and men.

In dull times there are two kinds of profit. One kind is the real thing; and the other kind is that course of action which prevents a dead loss.

I think if it could be known at what prices per hour high-class machine tools have been run during a dull period, the figures would be surprising. And some of the bidding on contract work would hold surprises too. In fact, estimating has not been brought very near to an exact science in many cases.

Suppose—and this is not a fanciful case—that the bids on a job of sixteen machines varied from $3,000 to $8,000. Who was guessing, who was estimating, and who was protecting his investment in money and men?

While no direct answer can be found to the question, we may read between the lines. The lowest bidder got the job. The next lowest bid, about $600 higher, was from a firm that had already built two or three of the machines, and was therefore able to estimate the job intelligently.

So it seems that until machinery gets to be a luxury, and it gets to be fashionable to keep a few milling machines or turret lathes in the house for ornamentation, or until buyers get to be less hard-boiled, we cannot always bid for as wide a margin of profit as we should like.

Autogenous Welding of Copper by the Oxyacetylene Process

By A. Eyles
Manchester, England

Characteristics of copper, especially when in the molten state — Fluxes not necessary — Precautions to be taken in making sound welds—Welded joints and their preparation

CERTAIN precautions are necessary in copper welding, since the metal has a great affinity for oxygen and, when molten, for hydrogen. The oxygen unites with the copper to form an oxide, and in the presence of molten copper the oxide is absorbed. Upon cooling, part of the oxide re-forms with detrimental effect on the strength of the metal. Further, in the event of oxygen, hydrogen, and carbon monoxide being absorbed when the welding operation is being conducted, these gases will surely be evolved as the metal begins to solidify, producing a porous weld. While special fluxes have been used in copper welding, recent results have proved that these substances are not really necessary, in fact they are of no value. If properly regulated, the oxyacetylene flame exercises a sufficient protective and deoxidizing action, in fact, it not merely protects the molten metal from oxidation by contact with the air, but even reduces any oxide that may be present. It is possible to effect sound welds in copper by the employment of a welding rod consisting solely of very pure copper. The writer recommends the use of copper of the best quality, and, if necessary, deoxidized with a very small percentage of phosphorous. Phosphorous should not be present in amounts over 1 per cent, otherwise the strength of the welded joint will be considerably weakened

In preparing the copper to be welded, it is first necessary that the edge of the joint should be perfectly

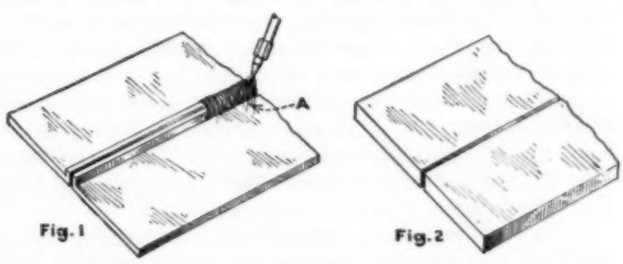


Fig. 1—Welding flanged sheets. Fig. 2—A butt joint

clean. Cleaning of the areas near the weld is also necessary. Impurities are detrimental, since they make the metal porous and spongy and may prevent the molten metal from filling all parts of the weld, causing cavities or blowholes. Various methods of cleaning copper are in use; pickling, filing, grinding, machining, scratch brushing, sand blasting, etc.; the essential factor being to remove, as perfectly as possible, all impurities from the vicinity of the weld. On very large sections or parts, sand blasting the areas to be welded is to be recommended. Chemical agents, such as nitric, muriatic, and sulphuric acids are sometimes employed, but it is preferable to precede their use by a mechanical cleaning.

Some of the preliminaries depend to a large extent upon the thickness of the metal to be welded. The work of welding thin sections and sheets, for example,

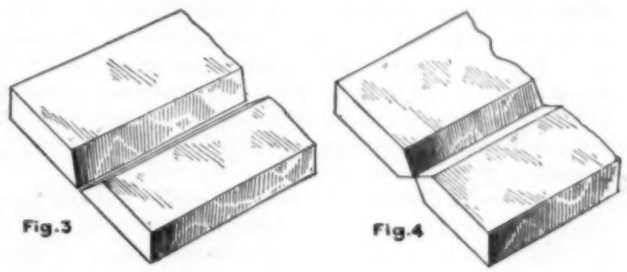


Fig. 3—A beveled joint. Fig. 4—Joint beveled from both sides

is facilitated if the edges are flanged or turned up at right angles as shown in Fig. 1. The depth of the flange should be from one and a half to twice the thickness of the metal. By this method the customary welding rod is not necessary, the edges being fused and providing the necessary material for the weld, as shown at *A*. It will be seen that heterogeneous metal does not enter the weld, the joint being entirely composed of metal identical with the surfaces to be welded. Sometimes it is advisable to tack the flanged pieces together by fusing the edges of the flange at intervals of from four to six inches, before fusing the whole flange. This method holds the work in alignment and prevents overlapping or spreading at the end farthest away from the point of welding. An allowance should be made for expansion and contraction, when welding longitudinal seams in cylinders, by inserting a wedge of appropriate size between the edges at some little distance from the point of welding. The rule is to set the edges out of parallel about $\frac{1}{4}$ in. to the foot. Thus a seam 8 ft. long should be tacked close together at one end, while the edges at the other end stand apart about 2 in. When the copper is from $\frac{1}{16}$ to $\frac{1}{8}$ in. thick, the edges may be butted together, as in Fig. 2. When the metal is above $\frac{1}{8}$ in. in thickness, the edges should be beveled, to enable the welding flame

to come in direct contact with the whole of the surfaces to be joined. In thicknesses of from ⅛ to 3/16 in., a slight open bevel is sufficient; from 3/16 to ¼ in., the angle of bevel at the weld should be about 90 deg., both edges being beveled to an angle of 45 deg., as shown in Fig. 3. The bottom edges should be set at least ⅛ in. apart before commencing to weld.

Whenever it is possible to work on both sides of sections over ¼ in. thick, the beveling should be in the

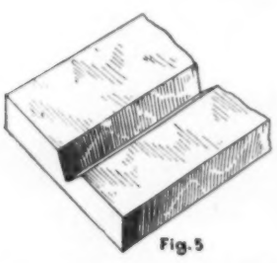


Fig.5

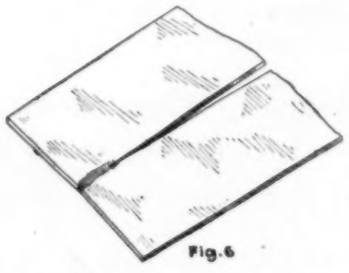


Fig.6

Fig. 5—Bevel carried to the bottom of a crack. Fig. 6—Sheets separated to prevent overlapping

form of an X as in Fig. 4. The angle of each open side should be at least 90 deg. In the case of cracks in thick sections which do not penetrate through the full thickness of the metal, the beveling should be carried to the bottom of the crack as in Fig. 5. The bottom of the groove should be thoroughly cleaned out with a chasing tool, to remove the last trace of impurity. Expert welders can sometimes effect welds in copper and its alloys up to ⅜ in. thick, without beveling, but this is a matter of individual skill, and the inexperienced should always bevel the edges of metal exceeding ⅛ in. thick.

When welding copper it is important to use the right size of torch-tip for the thickness of metal to be welded. A torch of deficient power produces the defect of adhesion, as also does the use of a torch of excess power. The size or power of a torch is denoted by the number of cu.ft. of gas consumed per hour when the flame is correctly adjusted or regulated. This quantity usually is marked on the torch, or if not it can be obtained from data supplied by the manufacturer. For copper 1/16 in. thick, a torch-tip consuming about 6.52 cu.ft. of gas per hour is used. For ⅛ in. thick the torch-tip most suitable, is one consuming 12.5 to 16.5 cu.ft. of gas, and for copper ¼ in. thick, one consuming about 30 cu.ft. per hour. To facilitate movement to and fro by the welder, the torch should be as light as possible,

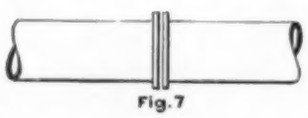


Fig.7

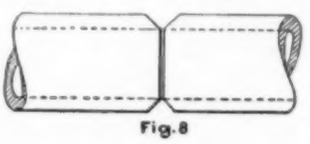


Fig.8

Fig. 7—Flanged joint on thin pipe. Fig. 8—Beveled joint on heavy pipe

but the need for lightness should not be allowed to prejudice its solidity or its good working. It is important that the welding torches should withstand any appreciable ill-effects of the marked heating they undergo, when welding thick copper sections, and that they should not be liable to back-firing. When back-firing occurs, small particles of molten copper are blown onto the operator, who is sometimes compelled to break off his work; this should be avoided as far as possible.

Excess of acetylene has a very bad effect upon the quality of the welds, for the molten metal becomes porous and filled with blowholes as a result of absorption of gas. On the other hand, excess of oxygen may lead to oxidation of the metal. A neutral flame should always be employed for welding copper. The white-hot, bulb-shaped part of the flame next to the tip should be clear and distinct. The noise made by a neutral flame is distinct and readily distinguished from that made by the carbonizing and oxidizing flames, being somewhat sharper than the carbonizing flame and not as shrill as the oxidizing flame. An ideal torch for copper welding is such that when the oxygen and acetylene supplies are once satisfactorily adjusted the adjustments will remain fixed.

Before any attempt is made to commence actual welding, the parts should be carefully arranged so that during the welding operation they remain perfectly in position. The employment of jigs in production work, and for occasional welding jobs, is exceedingly useful to hold parts in alignment and to eliminate distortion jigs also reduce the cost of production by increasing the speed of welding.

Preheating is necessary when welding large copper sections, and is desirable in most cases in order to save gas and reduce the time necessary for welding. The preheating of bars or small pieces of copper may be done with a charcoal fire, blow-torch, gas furnace, etc. The problem becomes more difficult when it is a

Fig.9

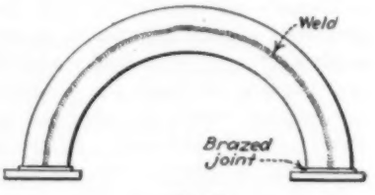


Fig.10

Fig. 9—Mandrel coated with insulating material Fig. 10—Welded U-bend

question of preheating large sections. To prevent loss of heat by radiation, it is desirable to make good use of vulcanite asbestos or asbestos paper. The work is then effected by the welding operator with much greater facility. Whenever possible, it is advisable to arrange beneath the lines of welding, an insulating material, such as vulcanite asbestos, or similar material, in order to prevent a thinning of the metal in the weld joint, and to prevent the dissipation of heat. Otherwise the heat would be conducted downwards from the metal onto the surface of the article that the welding is being performed upon.

It is recommended that before commencing actual welding, the insulating material should be heated by the torch flame along the region of the weld joint. The object is to drive out any moisture that may be in the material.

In executing the weld, care must be taken to avoid contact of the innermost flame with the metal just about to be melted. The distance of the white, inner flame should vary according to the size of the tip used; about ¼ in. to ½ in. from the molten metal. Copper will weld at about 1,080 deg. C., hence the flame need not have so high a temperature as for steel, and it

must not be concentrated on so small a surface. On account of the greater radiating (heat conducting) property, however, the total quantity of heat must be greater. The aim of the welder should be to distribute the heat over a large area, holding the flame point so it will not contact with the metal.

Copper welding requires promptness in execution. If the operator lingers too long, distortion and fracture in neighborhood areas may result, due to expansion stresses.

The torch flame should be held almost in a vertical direction. Copper when molten is quite fluid, which accounts for the angle at which the torch tip has to be manipulated to avoid blowing the metal ahead and producing adhesion. Another reason for applying the torch vertically, is that the molten metal is protected from the oxygen of the atmosphere by means of the enveloping flame.

The welding rod must be regularly incorporated in the line of welding, and must not be allowed to fall in globules upon the work. The operation must proceed quickly and should be continuous, taking care to attack, regularly and uniformly, the two edges of the metal, so as to bring about simultaneous fusion.

A welded copper-joint is composed of cast copper and therefore has the strength only of cast copper, but its tenacity can be increased by cold hammering over the area of the weld. Therefore, if the joint is to be hammered after welding, it should be made somewhat thicker than otherwise would be required, in order to provide sufficient metal for hammering flush with the remainder of the work. After the hammering operation, it is essential to anneal the copper by raising it to a red heat (650 deg. C.), then allowing it to cool slowly. The slower the cooling, the greater being the ameliorative effect. Many mechanics confuse the modern art of

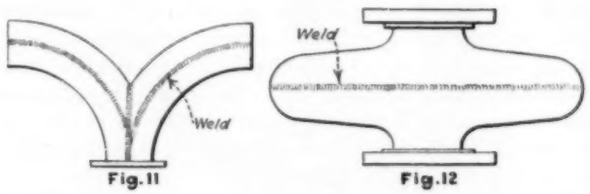


Fig. 11—Welded double-branch ell. Fig. 12—Welded expansion bulb

welding copper with that of brazing the metal with the blow-torch and a filler rod of more or less heterogeneous metal. This should not be, since the brazing process is entirely different and most readily distinguished from that of welding by oxyacetylene methods. Brazing always lacks continuity and uniformity of the mechanical properties of the joint that are so essential in making a sound, homogenous, and strong union. It is possible by employing oxyacetylene welding methods, that the junction of two or more pieces of copper may possess a homogenous structure. In other words, the metal of the weld may be regarded as possessing practically the same properties as the parent metal, and the extra thickness near the weld makes up for the slight difference in physical condition between the original metal and the new metal, which is in the cast condition. The welds or joints when hammered, present a neat and finished appearance; are sound and homogenous in structure. Also from every standpoint they are of a very satisfactory character.

In Fig. 6 is shown the method of separating sheet copper in order to prevent overlapping or spreading. The amount of separation, however, depends upon the thickness and nature of the metal. In general, the rule is to set the edges out of parallel about $\frac{1}{4}$ in. per foot. Fig. 7 shows flanged edges on thin copper pipes, preparatory to welding. The application of the torch

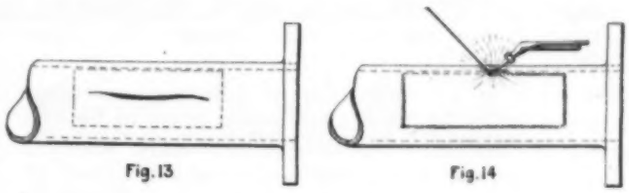


Fig. 13—A ruptured pipe. Fig. 14—Patch welded over the rupture

flame to both flanges simultaneously serves to fuse them together, effectively joining the two pipes. In Fig. 8 is shown a beveled joint on stouter material. Fig. 9 illustrates an iron mandrel coated with vulcanite asbestos, which is advantageous to place under the seam when welding copper cylinders. Fig. 10 shows a typical welded-copper U-bend. A difficult construction feature overcome by the oxyacetylene, autogenous-welding process in this case, was the brazing of brass flanges to the ends of the copper bend. In Fig. 11 is shown a double-branch ell, or three-way piece made from $\frac{1}{4}$-in. copper. Fig. 12 shows a copper expansion bulb, the halves being secured together with a welded joint around the bulb. Because of temperature changes, the expansion and contraction of piping in power plants demand careful consideration in the fabrication of pipe bends, flange materials, etc. In Fig. 13 is shown a longitudinal rupture in the copper steam-pipe of a locomotive smokebox. The dotted lines indicate a rectangular hole in the pipe, cut away to enable a patch of the same thickness of copper to be welded to the pipe. Fig. 14 shows a patch of new metal partially welded to the pipe. The speed and reliability with which such repairs are made greatly exceeds that accomplished by the use of a coppersmith's hearth-fire, or gas torch—the old means of making this class of repairs. In this article time and cost data have been purposely omitted, because in the present state of the art it is not possible to give accurate data on copper-welding repair jobs. Two good welders working either on production, or repairs of a similar character, will often vary as much as 33 per cent in the time consumed, and since shop conditions also vary to a great extent, it is exceedingly difficult to give accurate figures regarding costs.

In conclusion, it may be mentioned that doubts are sometimes cast on the strength of copper welds. As a matter of fact, the welded joint is often actually stronger than the original metal, and copper pipes that have been repaired by reliable welders, have stood the test of many years of service. If any oxyacetylene, autogenous weld is made with metal of the same composition as the pipe joints to be welded; if time is allowed for the proper heating of the work before the welding rod is introduced; and the weld is built correctly from the bottom of the pipe to the surface, there is nothing to prevent a good weld that will give a high degree of strength, and will therefore have long life in service.

Book Reviews

Harvard Business Reports. Compiled by and published for the Graduate School of Business Administration, George F. Baker Foundation, Harvard University. Five hundred sixty-one pages, 6x9 in. Illustrated. Published by the A. W. Shaw Co., Cass, Huron and Erie Sts., Chicago, Ill. Price $7.50.

The book is a compilation of 149 business cases selected from a total of 3,500 cases collected by the Bureau of Business Research and brought together primarily for use in the Harvard Graduate School of Business Administration. The book can however be used, and is so intended, as a constructive guide and aid in all lines of actual business administration.

Each case has been selected as being typical of some phase of business. Conditions are outlined, and the steps taken to establish operating control, to overcome faults, to meet points at law, and to better current practices are given. There is hardly a phase of business administration from organization, purchasing, and stock control through manufacturing to selling and financing, that is not touched on.

The book is the first of a series that it is proposed to publish, as new cases are investigated and classified and as additional cases are found that merit addition to those already set forth.

The cases are not to be used as the school's recommendation of procedure which cannot be improved upon as no such implication is intended. They are suggestive, only, of what can be accomplished under each given set of conditions. We recommend the book to all executives as a useful and important addition to their business libraries.

Commercial Survey of The Philadelphia Marketing Area. By J. Frederick Dewhurst. Domestic Commerce Series, No. 1. One hundred thirty 6x9-in. pages. Published by the Department of Commerce, Washington, D. C. Price 20c.

This publication is the first of several similar ones to analyze the various marketing areas into which the country has been divided arbitrarily by the Department of Commerce.

The aim of the book is to thoroughly consider the various activities of the districts within the area, to show what materials are produced to a surplus and what goods are needed within the district.

Waste in efforts of distribution are thereby reduced in that a clearer notion may be had of where it is profitable and where not profitable to market goods on account of the nature of the native industries.

Thirteenth Annual Report of the Secretary of Commerce. For the fiscal year ended June 30, 1925. Two hundred and fourteen 6x9-in. pages. Published by the Department of Commerce. Price 20c.

This report of the Secretary of Commerce is divided into four parts:

I. Progress in the elimination of waste; II. Economic review; III. Legislative recommendations; IV. Condensed reports of the bureaus.

The work of the department is systematically and briefly described and it shows a continuation of the progress that has been made under the direction of Secretary Hoover. Particularly interesting to readers of the *American Machinist* will be found the survey of the large amount of field work and the great number of foreign offices maintained by the department, as well as the statistics and story of our increasing foreign commerce.

Industrial Furnaces, Part II. By W. Trinks. 405 pages, 6x9 in., clothboard covers. Illustrated. Published by John Wiley & Sons, Inc., New York, N. Y. Price, $5.50.

While the book is a continuation of one previously written on the subject, it is complete in itself due to the manner in which the subject matter of the two volumes has been grouped. This volume handles the subject from one of practical application, while the other dealt largely with theoretical design.

There are seven main chapters in which subjects of interest to the furnace user are treated. Some of them are, fuels and sources of heat energy, combustion devices and heating elements, control of furnace temperature and of furnace atmosphere, labor-saving appliances, comparison of fuels and furnace types and selection of fuel and furnace to suit plant conditions.

Each chapter is subdivided into its important phases and equipment for all applications is described and compared.

The reader who has to do with industrial furnace use will find a great deal in the book to help him obtain economical results with his present installations as well as to plan constructively for future improvement.

Proceedings of the Twelfth Annual Meeting of the International Association of Public Employment Services. Bulletin No. 400 of the United States Bureau of Labor Statistics. Forty-six pages, 6x9 in. Published by the Department of Labor. Price 10c. This bulletin contains the addresses that were made by labor officials from the United States and from Canada on questions relating to public employment agencies, wastage of men, employment statistics, interviewing applicants and private employment agencies. These addresses were made by men who have had considerable experience in this field and will prove useful to personnel managers especially in the larger organizations.

An Investigation of the Efficiency and Durability of Spur Gears. By C. W. Ham and J. W. Huckert. Bulletin No. 149 of the University of Illinois Engineering Experiment Station. Published by the University at Urbana, Ill. Price 50c. This bulletin describes the apparatus and methods used in the conducting of the efficiency tests and gives the test data and result diagrams that were obtained from their work. The bulletin includes a study of the effect of lubrication, tooth proportions and irregularity of tooth spacing on gear efficiency.

A bibliography and collection of formulas on spur-gearing efficiency is given in the appendices.

Domestic Market Possibilities for Sales of Paints and Varnishes. By George H. Priest, Jr. Domestic Commerce Series, No. 2. Twenty-eight 6x9-in. pages. Published by the Department of Commerce, Washington, D. C. Price 5c. This pamphlet is a study of marketing problems and an analysis of domestic markets for paints and varnishes. The aim has been to ascertain the factors governing the markets, and a study of the districts in which there is the greatest opportunity for distribution.

Automotive Production

How Motor-Truck Parts Are Gaged

By Fred H. Colvin
Editor, *American Machinist*

A few typical examples of the gages and methods used in manufacture by the General Motor Truck Co. at the Pontiac plant

ECONOMICAL and accurate inspection is as much a part of manufacture as the machining of the parts themselves, so that the gages and methods are of vital interest. Not only must the gages be accurate but they must be so designed as to be used quickly and to require as little manipulation as possible. Further than this they must not allow the work to be gaged in such a way as to show a false reading. A few of the gages used in the manufacture of the General Motor Truck Co. at Pontiac, Mich., are shown herewith.

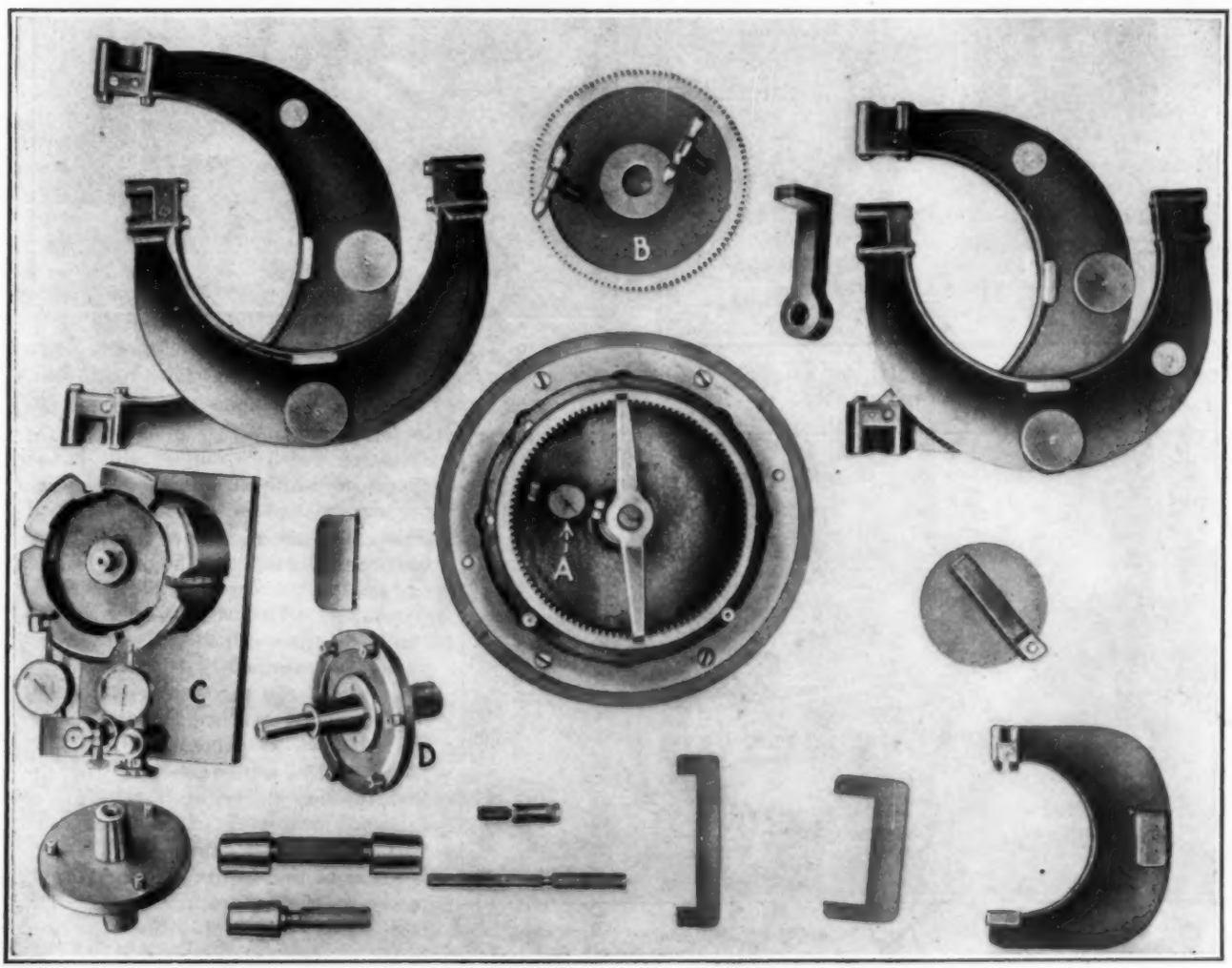


Fig. 1—Gages for clutch parts

AUTOMOTIVE PRODUCTION

In Fig. 1 are the gages for the driving and driven drums of the clutch. The dial gage *A* in the center indicates the root depth of the tooth and also checks the concentricity of the root depth at any position around the central stud. This is done by pulling the gage up and turning it to any part of the circle desired.

The arm across the gage is for checking the height of the clutch drum, over-all, or from the base to the top. This gage works on the flush-pin principle, the diagonal line across the central stud showing the high and low limit, or "go" and "no go" points. Directly above this gage, at *B*, is a master gear or gage that fits inside the clutch arm, and is used to test the work as it comes from the gear shapers.

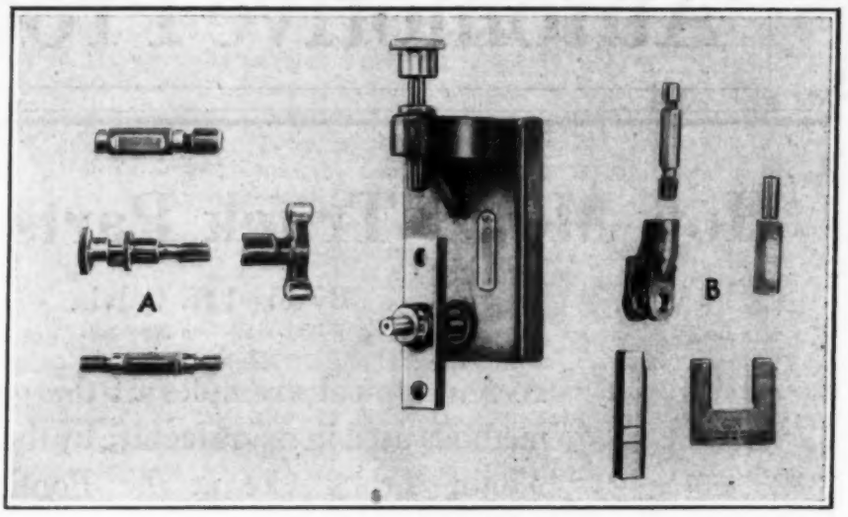


Fig. 2—Brake and shifter-rod gages

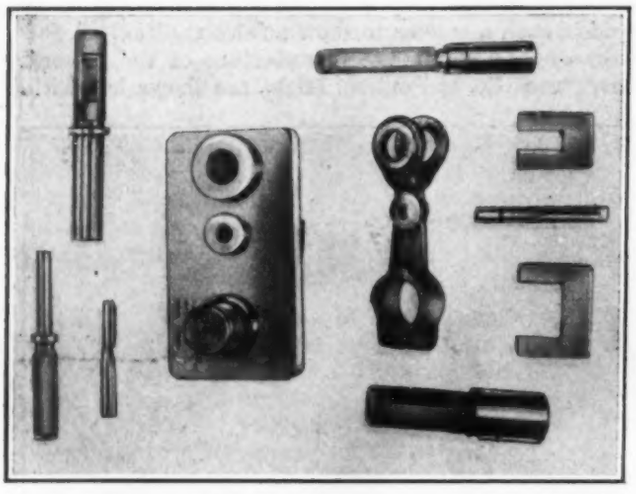


Fig. 3—Gages for checking diameter and correct location of holes in brake rocker shaft

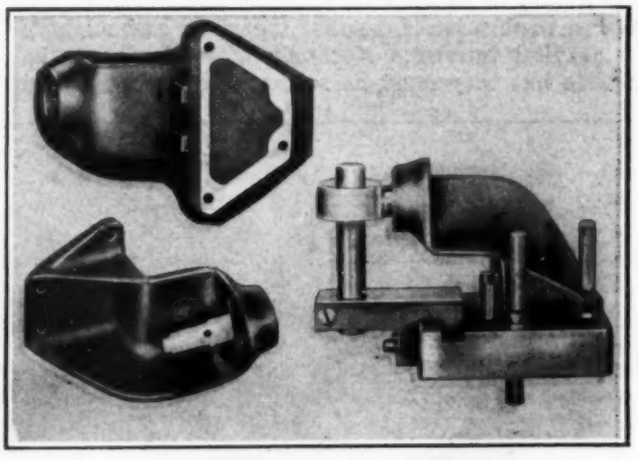


Fig. 4—Inspecting engine support bracket

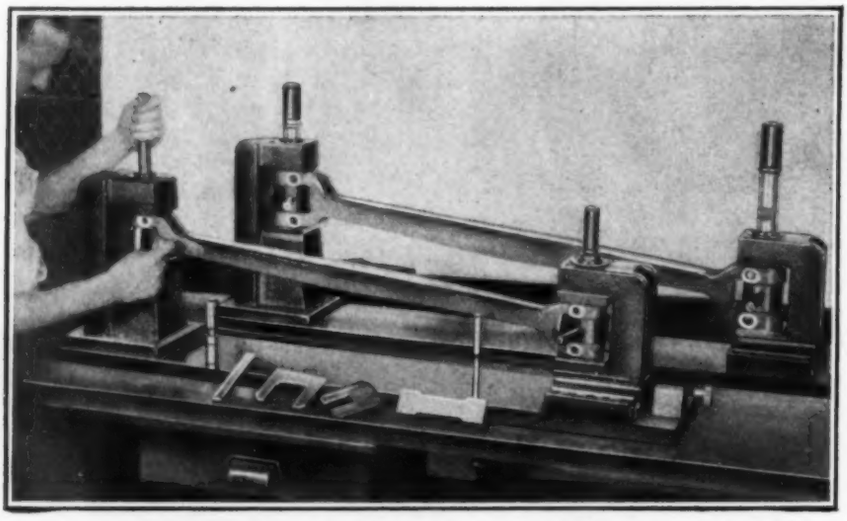


Fig. 5—Functional gages for two sizes of radius rods that test both diameter and angles of holes, as well as fork openings for connections

At *C* is the spider that carries the inner rings and two dial gages for checking the relation of the flange openings, while at *D* is a fixed gage for testing the location of the six slots. Below this are the gages for the hole to receive the tapered end of the shaft, one testing the keyways and the other the taper. The snap gages at the right test the outer diameters of various clutch members.

In Fig. 2 the three gages at *A* are for inspecting the brake-rod adjuster. An adjuster is shown at the right. At *B* is the adjustable end for the transmission shifter rod. The use of the snap and plug gages is obvious. The location of the threaded hole with relation to the opening in the fork is tested by the fixture at the left. The fork is placed on the flat bar and the threaded plug screwed in the end to test the relative locations of

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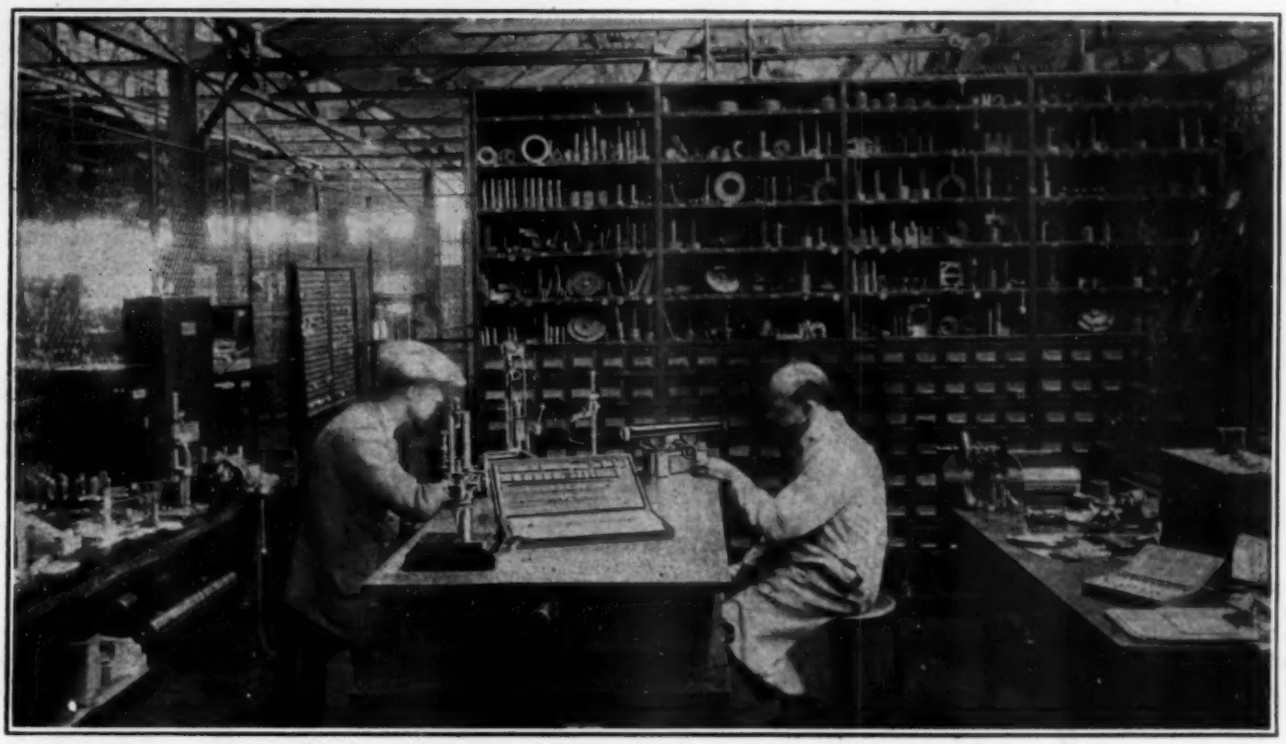


Fig. 6—General view of part of gage room

tapped hole and fork, testing the alignment of the opening. While in this position the alignment of the holes in the ears can be tested with the plain plug gage at the right. By using the other end of the flat bar another size of fork is inspected.

The gages for the brake rocker-shaft lever are shown in Fig. 3, and the gaging methods can be seen with little difficulty. Placing the lower end of the lever on the stud of the gage, the location and spacing of the other holes can be checked, and the keyway tested by the square gage at the left.

The engine for this truck is supported by the brackets shown in Fig. 4, which also shows how they are tested both for location of holes and alignment of the base and bearing hole in the projection. The base of the bracket is first located on the gage and the plugs inserted. Then the end plug is put in place and its squared base swung into position in the groove, being located by the pins shown in front. In this way both the parallelism of the hole and its distance from the base is checked in the one gage.

Gages for Radius Rods

Functional gages for two sizes of radius rods are shown in Fig. 5. The small gages test the distance between forks, fork end thickness and the diameter of the holes. The center distances, the angularity and the squareness of the holes are tested by placing the radius rods in the gaging fixtures shown. The gages that are shown in the forks represent the connection that goes between them, and if the plug gage goes through assembly is assured. Variations in center distance are shown by the micrometer screw adjustment at the base of the right-hand blocks.

A little idea of the way in which these and the hundreds of other gages are kept, is seen in Fig. 6, this being a front view of the special section of the gage room in which standard and special gages are kept. The large surface plate in the center, the "Jo" blocks, scleroscopes and height gage give a little idea of the care taken in this department.

Government Aid for Standards

Assistance of the division of simplified practice of the Department of Commerce has been offered in securing from manufacturers, distributors and consumers of automotive parts a more general acceptance of the standards of the Society of Automotive Engineers and, consequently, a more widespread application of the standards in actual practice.

As a result of conferences in Washington with representatives of manufacturers and users, the society was asked some time ago to review and, where advisable, to revise its specifications for spark plugs, brake lining, taper roller bearings and oversize piston rings. When the revised standards are ready for presentation, the conferences will be reconvened.

The division of simplified practice is confident that the results will be as gratifying in the automotive field as they have been in others, and looks forward to the outcome as another demonstration of the value of cooperation in standardization. It is one thing, however, to have standards appear in a handbook and quite another thing to have them appear in the finished product. It is only when the "paper" standards are transmuted into the metal of the car itself that their real values are adequately demonstrated.

AUTOMOTIVE PRODUCTION

Abstracts

from other publications

Machining Bevel Gears

In the manufacture of Timken bevel gearing, the gear blank is made of a special vanadium steel which is first normalized to relieve the strains incurred in the forging process and to make the machining easier. The blanks are then ready to be turned and the following limits are laid down: the profile angles on gears are held to a limit of plus and minus 0.002 in. and the bore of the ring gear is held to 0.001-in. limit. Blanks are checked very thoroughly, on specially-made fixtures, for run-out on the outside diameter and the face angles. They are then given a copper-plating treatment and placed on a cylindrical grinder. All traces of copper are removed from the outside diameter or back angle of the teeth so that the teeth of the gear alone can be carburized and hardened. The pinion blanks are not copper-plated.

Gears and pinions are next placed in spiral-gear roughing machines leaving only a slight amount of each tooth for finish generating, which is done in a Gleason spiral finish-generating machine. Every gear and pinion is tried on a specially-designed gear-testing machine and checked against a master unit. The corrected addendum and normal chordal thickness of teeth is checked and held to close limits. The gears and teeth are then chamfered to prevent chipping off in service and finally the teeth are burnished by running them with a hardened gear before they are carburized and hardened. The last operation is the matching one, each gear and pinion being mated. Under the manufacturing methods and design, rejections average 3 to 5 per cent. —*Timken Magazine*, Nov. 1925, p. 550.

General Motors and British Activities

J. D. Mooney, vice-president of the General Motors Corporation, addressed the American Chamber of Commerce in London and discussed the taking over of the management of the Vauxhall Motors, stating that the General Motors Corporation intended to continue the English management. He also says, "we feel that the motor vehicle will continue to occupy a position of increasing importance in relation to the various economic and social developments that will occur during the next several years in the affairs of the nations of the world. Further, we believe that the use of motor cars will have a remarkable growth in the British Empire. During the next ten years the British Empire will move forward aggressively and rapidly in the development of its own economic coherence and strength. In this movement forward, broad and intensive use of motor transport will be made, as one of the readily available and valuable instruments. During this period we shall witness a rapid increase in the use of motor vehicles in the British Empire. The market for motor vehicles is assured.

"For the purposes of sound investment it is necessary that the manufacturing position be determined. There are several economic factors entirely favorable to the manufacture of motor cars in England. The raw materials are readily available. Industrial and production facilities exist within comparatively limited areas, and transport and communication are easy There is a complete industrial background, including all of the elements of personnel, management, engineering and mechanical craftsmanship to support a broad manufacturing program. Skilled labor of the right type is available.

"I can summarize the position of the General Motors Corporation, therefore, by stating that we find here the general elements that provide a sound basis for investment in the motor industry: high character values, the amount and character of labor needed, the fundamental production facilities, and an expanding market."—*Motor* (England), Nov. 2, p. 42.

Electrical Testing

In discussing how to test and diagnose the electrical system it is stated that a set of test points provides a very simple but practical method of checking and testing the greater part of a starting, lighting and ignition system in use on an automobile. The set consists essentially of an ordinary drop light provided with two insulated leads attached to the test points proper, and connected in a 110-volt circuit as described in the article. When the test points are brought together, current will pass and light the lamp if the circuit is complete. If, however, there is faulty wiring the lamp will not light. This method of locating grounds, short circuits and open circuits is far superior to the use of the bell, buzzer or magneto. This article also points out that every service station aiming to take care of electrical equipment should have reliable electrical measuring instruments, the two most important being the voltammeter and the hydrometer.—*Automobile Trade Journal*, Dec. 1, p. 36.

Chevrolet Service Schools

In its effort to promote a uniform standard of service for Chevrolet owners, the Chevrolet Motor Co. is planning to double the number of its service instruction schools and it is expected by the service promotion department that twenty of these schools will be in operation before the first of the year. Separate courses of one week each are given in the schools for mechanics, service foremen and service station operators. There are now seventy-five engaged in the joint work under skilled instructors in model shops. Using precision equipment, they are shown the quickest and most efficient manner of doing all servicing operations. The course for service foremen is slightly more comprehensive, while that for service station owners goes into such details as shop layout, service department administration, maintenance of parts stocks, the flat-rate system and account keeping. "The service schools and the service promotion department work hand in hand." —*Automobile Topics*, Nov. 28, p. 221.

The Elizabethport Shops of the Central R.R. of New Jersey

By S. Ashton Hand
Associate Editor, *American Machinist*

Making taper frame bolts—Tool-lifting device for the planer—Planing crossheads—Tool for truing cylinder ends—Large work in a turret lathe

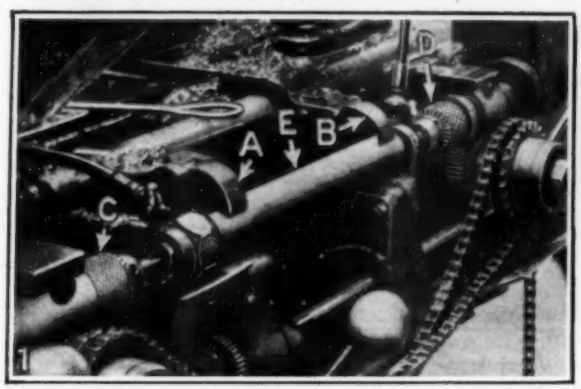
IN THE Elizabethport shops of the Central R.R. of New Jersey, many new machines have been added to the equipment in the last two or three years, bringing it well up to date and materially lowering the cost of parts produced.

Among the newer machines may be mentioned, a large, planer-type Ingersoll milling machine; a Sellers driving-wheel lathe; several Warner & Swasey turret-lathes; two National Acme automatic screw machines; a Libby turret-lathe; a Norton grinder for piston rods; a Diamond grinder for crosshead guides and other flat work; several Bullard vertical lathes; and a complete outfit for the rapid production of frame and stay bolts.

A great deal of small stuff is manufactured for distribution to other shops of the road, a large and well-equipped storeroom being maintained for storage and issuance. Heavy castings and tires are stored in large quantities in the yard, which is well served by a gantry crane.

Much of the work in the locomotive shop and nearly all the work in the car shops, is done by the piece.

While there is the usual amount of welding, both



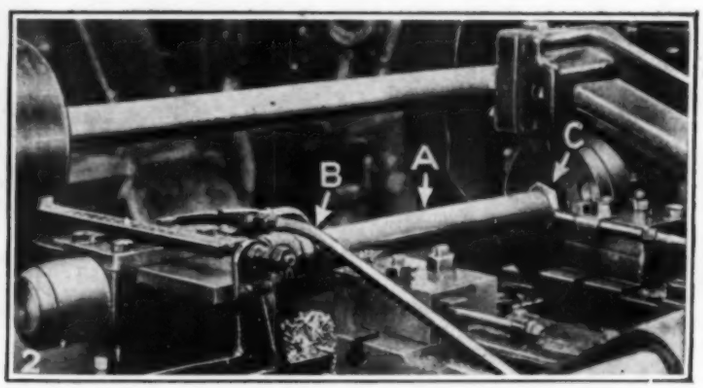


Fig. 1—Frame bolts are centered at the back of the machine. Fig. 2—At the top of the machine the ends are rounded and the under side of the heads faced

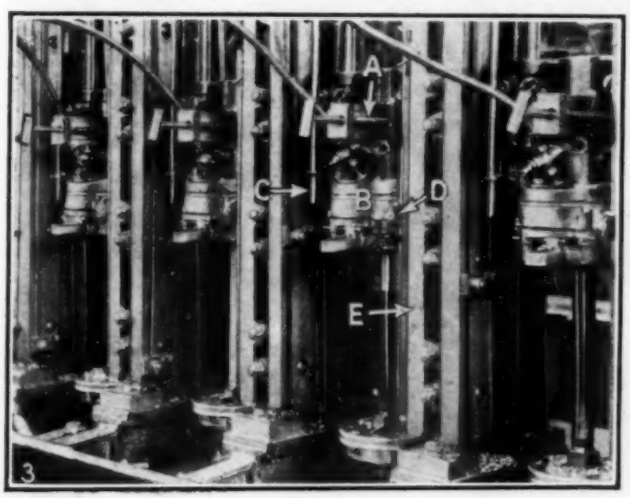


Fig. 3—Multiple-spindle machine for turning taper frame bolts

flame and arc, the Thermit process has given away to the oxyacetylene torch. Back and front sheets of fire boxes, as well as flue sheets, are electric welded in place, the welding being done from the inside. After completion of the inside work, the exteriors of the joints are slightly grooved with a chisel and the grooves filled in with welding rod in the usual manner. Where the flue sheets are welded to the front sheets, additional strength is given to the joints by welding short pieces of flat stock laid across the flanges.

Shoes and wedges are made of brass, both for its excellent non-friction qualities and its freedom from liability to breakage in service.

An economy noticed in the redressing of worn piston rods, is the practice of grinding only the small lengths at each end that have not been worn by the metallic packing. These parts are ground to the same diameter as the worn parts, removing the shoulders at the ends of the latter. Of course, if the worn parts of the rods are badly out of round it is necessary to grind them

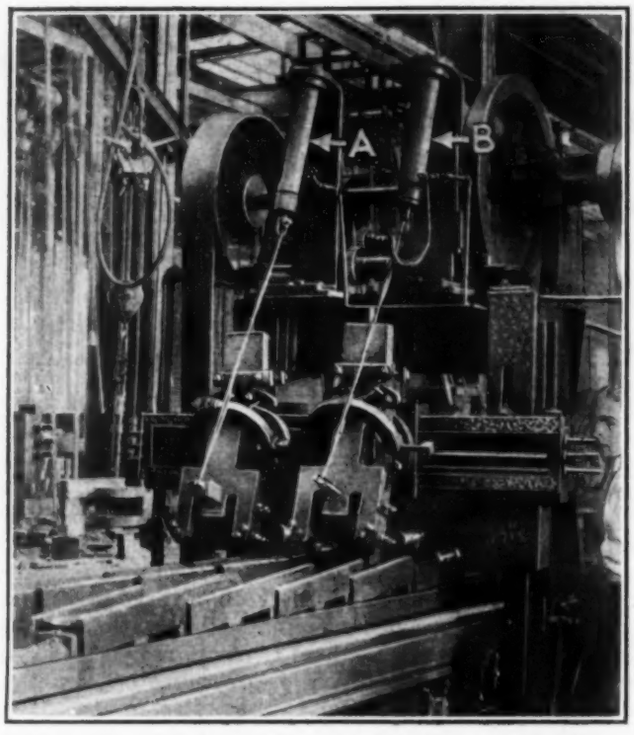


Fig. 4—Pneumatic device for lifting planer tools

their entire lengths. Otherwise, grinding at the ends only, not only saves time, but leaves untouched the surfaces that have been highly glazed by the packing, and which are in better condition to resist wear than if they had been resurfaced.

In the making of tapered frame bolts, the forgings are first centered in an attachment at the rear of a special machine that forms one cycle in the chain of operations. The attachment, shown in Fig. 1, consists of the centering and holding clamps *A* and *B*, and the two opposed spindles *C* and *D*, in the latter of which combinations center drills and countersinks are used Both the clamps and the spindles can be adjusted on the bed of the machine to accommodate bolts of various lengths. The chains to be seen in the foreground, support counterweights for returning the drill spindles to the open position. A bolt in position for centering may be seen at *E*.

After the centering operation, the bolt is transferred to the upper part of the machine, as at *A*, Fig. 2. Here it is brought to the proper length and the end slightly rounded by a tool at *B*, though not visible in the illustration. At the same time, the tool at *C* faces the under side of the head and cuts a clearance groove in the body slightly under the finished diameter. The operation of this part of the machine is entirely automatic.

For turning, the bolts are placed in a four-spindle automatic machine, the operating parts of which are shown in Fig. 3. The bolts are driven by the heads as can be seen. Each unit of the machine has a tailstock at *A*, and a cutting head at *B*, the latter having four cutters. Provision is made for adjusting the cutters for size. At *C* is a stop for both limiting the travel of the cutting tools and for opening them as in a self-opening diehead. At the completion of the cut, the cutter head is automatically returned to the starting position. A connecting arm at *D* slides upon a vertical taper bar at *E* and opens the cutters gradually as the head descends. In the unit at the right, the bolts are turned for the thread, while in the next one to the left, tits are formed to protect the threads when driving the bolts out of the frames. The two other units are

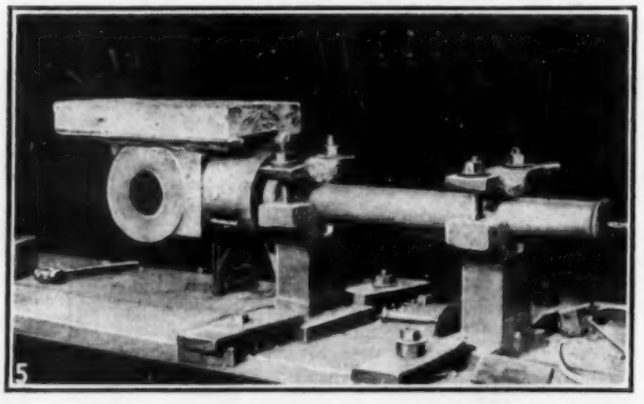
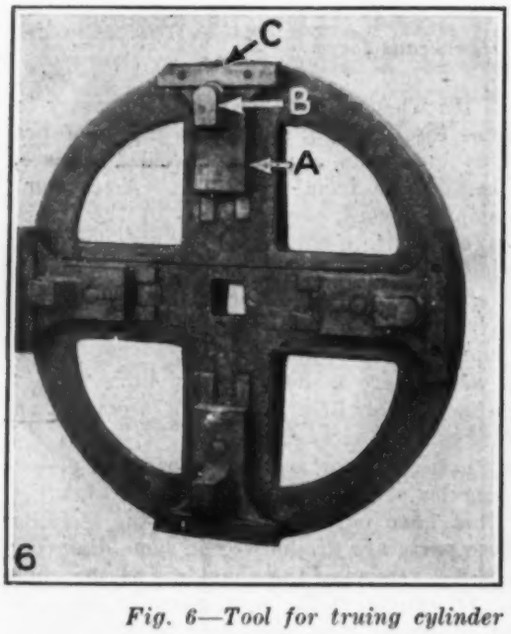


Fig. 5—Crosshead mounted for planing



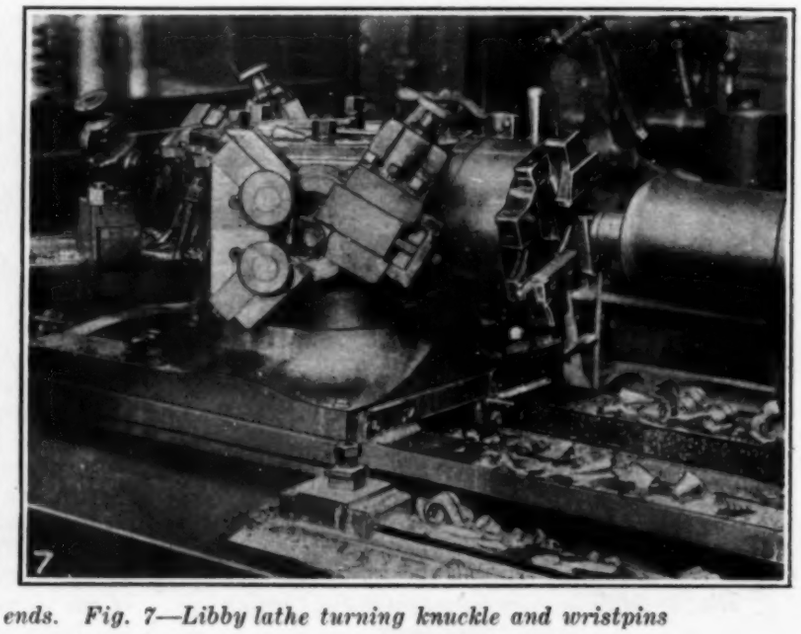


Fig. 6—Tool for truing cylinder ends. Fig. 7—Libby lathe turning knuckle and wristpins

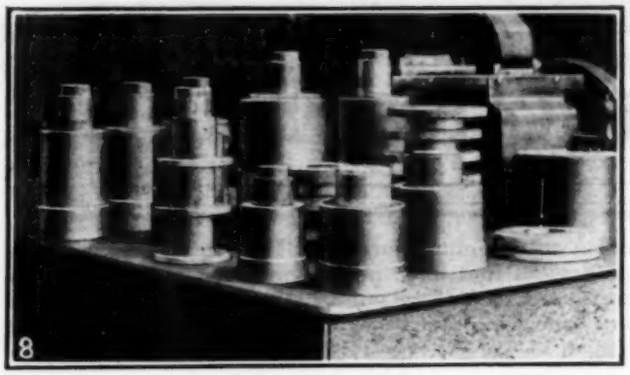


Fig. 8—Products of Libby lathe

used, respectively, for rough and finish turning the taper bodies. Threading is done in a bolt cutter conveniently placed. The centering, facing, and turning are all done by one man. The machines were built by the Special Bolt Machinery Corporation. A machine similar to the turning machine, and built by the same maker, is used for threading staybolts.

The planer for planing shoes and wedges has been fitted with an automatic stool-lifting device, as shown in Fig. 4. While such devices are regularly incorporated in planers by some makers, they lift the tools enough for clearance on flat work only. Where straddle tools are used on such work as shoes and wedges a very high lift is required. On the planer referred to, the pneumatic cylinders *A* and *B* are supported by a pair of angular brackets attached to the cross-girt of the machine. Ropes lead from pistons of the cylinders to bolts in the tool holders, as shown. A cock in the air line is opened and closed by a tappet on the planer table, so that the pistons raise the tools at the commencement of the return stroke and lower them at the next reversal.

Crossheads are babbitted and then planed. A dummy piston rod is driven in the taper hole and mounted in V-blocks clamped to the table of the planer, as shown in Fig. 5. This method insures proper alignment.

Contrary to the usual custom, cylinder heads are not ground to their seats at the cylinder ends. If they are in bad condition they are refaced in the boring mill. In any event, instead of grinding them in, the cylinder ends are trued by the tool shown in Fig. 6. The tool is mounted on a shaft having a square shoulder to fit the hole in the center. The shaft passes through the cylinder and is held at the other end by a cross-bar and nut. Outside of the tool, a heavy spring between it and a collar on the shaft gives cutting pressure. The extreme end of the shaft is tapered to fit an air motor by which both it and the tool are revolved.

The tool is equipped with four adjustable slides, as at A, each of which carries a hardened steel roller *B* and a section of a file *C*, the latter being held by two countersunk bolts, the heads of which are below the surface of the file. The slides are adjusted so the rollers bear in the counterbore. After the cylinder end has been trued by the files, the tool is backed off and abrasive cloth is fastened over the files. A few revolutions then puts a good finish on the cylinder end. This method is much quicker than grinding and the shop superintendent, T. B. Dickerson, designer of the tool, says the joints so made are absolutely steam tight.

Fig. 10 — Core drill with high-speed steel cutting end

Knuckles and wristpins are made from old axles in the Libby lathe shown in Fig. 7. A variety of the product of this machine, including some large washers, is shown in Fig. 8. The chips to be seen on the bed of the lathe are conclusive evidence that good sized cuts are taken. Work turned out in this way, more nearly approaches manufacturing than is generally practiced in railroad shops.

A heavy Ingersoll milling machine is shown in Fig. 9. On this machine, all the side and connecting rods are milled, also a variety of other work. A good stock of cutters is kept on hand and they are kept in excellent condition in the toolroom, which is exceptionally well equipped.

Where cored holes of large diameter are drilled to size, a four-lipped core drill is used, as is the usual practice. However, such drills, as made in the toolroom of this shop, differ somewhat from the usual construction. Instead of being made wholly of tool steel, the shank and the greater part of the body are of machinery steel. One of these drills is shown in Fig. 10, where it will be seen that the cutting end *A* is a separate piece. It is made from high-speed steel, held to the body by a heavy screw. A large pin, half in the body and half in the cutting end, takes the thrust of the cut. That the tang is not dependent upon for driving is evidenced by the Woodruff key at *B* in the taper shank.

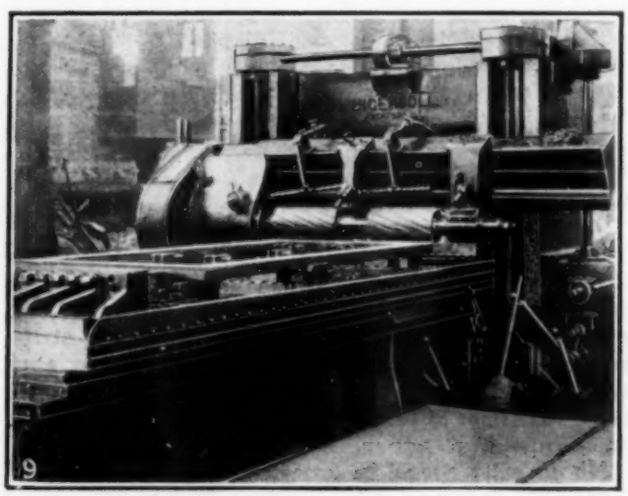


Fig. 9—A heavy Ingersoll milling machine

Take Care of Your Scrap

Clean scrap, carefully sorted, will bring a higher market price than will miscellaneous, dirty scrap.

Brass scrap should be handled so as to prevent any chips of other metals from being mixed with it. Heavy steel turnings should be separated from light turnings or screw-machine cuttings of the same metal. If all bulky scrap is compressed into bundles, so much the better.

Your scrap turnings represent real money and it is up to you to get the maximum price for them.

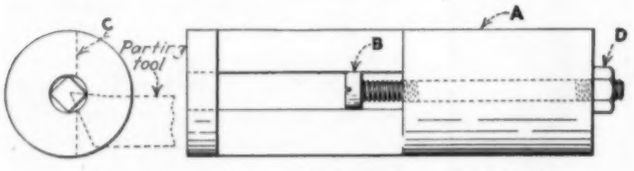
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Cutting Off Square Stock in the Screw Machine

BY H. MOORE

We use large quantities of ½-in. square bars cut in various lengths, from ¾ to 2 in. An old, hand screw machine is used for cutting the bars, and, to prevent the terrific jarring and noise connected with such work, we devised the backrest shown in the illustration.



Backrest used for cutting off square stock

The body *A* is made to fit one of the turret holes and is bored at the front to the corner-to-corner dimension of the square bars to be cut. It is further drilled and tapped for the stop screw at *B*. The stock is then milled away as at *C*, cutting away about one-third the diameter of the hole. It is then casehardened.

In use, the stop screw is set for cutting a piece of the bar to the required length and then locked by the nut *D*. The body is then put in the turret and fastened in the usual manner.

The bar is fed in to touch the head of the stop screw and the parting tool is used close up to the unmilled portion at the front. The bar is thus firmly supported and no jarring or chattering is noticeable.

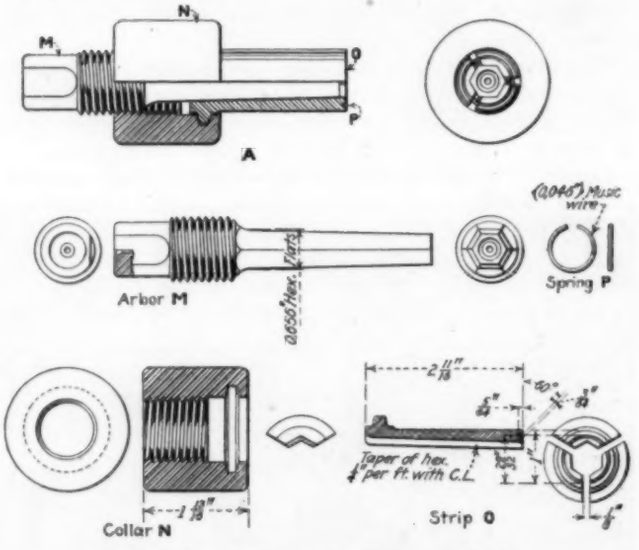
An Unusual Type of Expanding Mandrel

BY ALFRED T. GREGORY

A rather unusual type of expanding mandrel is shown in the illustration. It is very rigid, accurate and simple to operate, making it equally adaptable to accurate production work or to work requiring heavy cuts. In the assembly at *A*, a twist of the collar *N* by hand is sufficient to grip a 20-in. pulley tight enough for a roughing cut.

As will be seen from the illustration the mandrel consists of six parts: an arbor *M*, collar *N*, the three strips *O* and the spring *P*. Parts *M*, *N* and *O* are made of machine steel, casehardened and ground. It should be noted that there is always a full bearing between the strips *O* and the arbor *M*, which makes for rigidity as well as for minimum wear and preserves accuracy. The hexagon shape of the arbor serves as a positive guide for the strips, thus preventing any possibility of their slipping out of place.

The strips *O* are made from one solid piece by first rough turning the outside and boring the hole to the correct taper of the "cross flats" dimensions. The next operation is that of cutting out the three pieces on a milling machine. They are then secured, one at a time, in a vise on a milling machine for milling the two sides of the hex, the taper hole serving as a guide to give the correct setting. The strips should then be placed with their ends flush on the arbor *M*, a temporary collar having a hole of the correct size, slipped over them, and the arbor driven tightly into the assembly. The strips can now be finish turned on both ends, and the cut made for the spring *P*. After this operation the temporary collar is removed and the whole mandrel assembled as at *A*. To finish the strips, tighten a narrow ring (about ⅛ in. wide and having a hole slightly larger than the required finished diameter) on the arbor close to collar



Details of the expanding mandrel

N and turn. Then remove the ring and place it on the finished part of the mandrel, tightening it as before, when the finish turning of the outside of the strips can be completed. After hardening, it is an easy matter to grind the hex's in a surface grinder and finish grind the strips in the same manner in which they were finish turned.

No difficulty should be experienced in machining the hex on the arbor, since it can be milled by the use of

IDEAS FROM PRACTICAL MEN

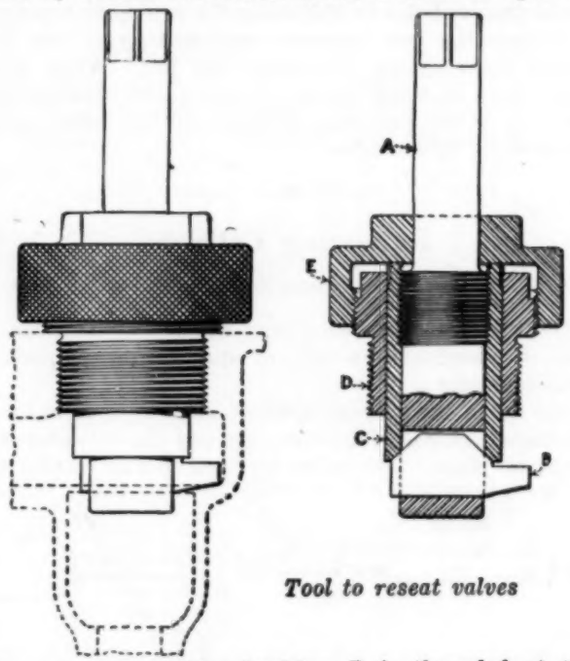
a dividing head and ground accurately on the centers of a B. & S. or similar grinder. Of course it goes without saying that the centers should be lapped to a fine surface. The annular groove in collar *N* should be ground to provide a smooth, accurate seat for the lip on the strips.

Reseating Tool for Valves of Automotive Engines

By Harold A. Peters

In recutting valve seats in cylinders of the solid-head type, it is necessary to remove the corroded metal around the old seats, else it is not possible to secure new seats that will endure. A hand-operated tool designed for the purpose of recutting seats in such cylinders is shown in the accompanying sketch.

A machine-steel body *A* has a driving square at one end, and at the other end a slot is made to receive the high-speed steel cutter blade *B*, which is held in place by the hardened-steel sleeve *C* screwed upon the



Tool to reseat valves

body. A two-shoulder bushing *D* is threaded at the smaller end to fit the thread in the plug hole of the combustion chamber and at the other end to take the feed nut *E*, which is knurled on the outside for convenience of manipulation. The bore of bushing *D* is a neat running fit for the steel sleeve. The upper end of the bushing is made hexagon so that a wrench may be applied.

In operation, the body *A*, with cutter *B* and sleeve *C* in place, is set into the combustion chamber. The threaded bushing *D* is then slipped over the sleeve *C* and screwed into the plug hole as far as it will go. Feed nut *E* is then screwed by hand on the projecting end of bushing *D* until it bears upon the end of the steel sleeve.

By means of special wrenches the body of the tool is then revolved and the feed nut advanced by hand as the work proceeds. This tool has proved quite satisfactory in many of our service stations.

Tool for Making Cupped Washers

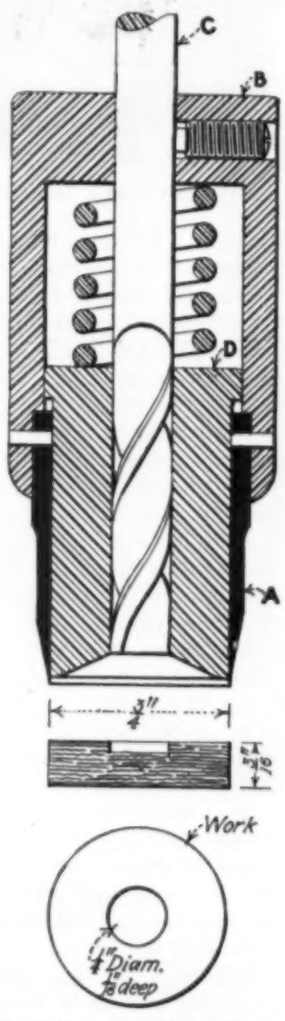
By H. L. Wheeler

Leather cup-washers, such as the one shown at the bottom of the illustration, were required in lots of 100 only. The problem was to produce them economically and for this purpose the tool shown was designed. The washers are ¾ in. outside diameter by $\frac{1}{16}$ in. thick and have a recess on one side ½ in. in diameter by $\frac{1}{16}$ in. deep. The material used was new leather scraps.

The tool was used on a small drilling machine. The cutter *A* is turned to fit freely in the casing *B* and is held in place by means of a bayonet joint. It is also turned to a nice bevel edge and tempered. The twist drill *C* is ground on the point to produce a flat bottom in the recess. A ¼-in. set-screw secures the casing and prevents slipping of the drill.

The bayonet joint makes it easy to remove the cutter for cleaning out the accumulation of leather dust and for sharpening the cutter. The tool will fill up after cutting about one hundred pieces, and must be cleaned. By a simple twist of the cutter with the hand the whole tool can be quickly disassembled, and cleaning and putting back is about a three-minute job. It works much better without oiling the parts, since oil has a tendency to quickly gum up and cause the ejector *D* to stick.

In use, the shank of the drill is gripped in the drill chuck in the usual way and the material is placed on a piece of maple board to prevent the keen cutting edge from coming in contact with the drilling-machine table, which would quickly ruin the tool. Two or three nails are driven into the board and project about ¼ in. to provide stops for the leather scraps, as they are held with the hand.



Tool for cupped washers

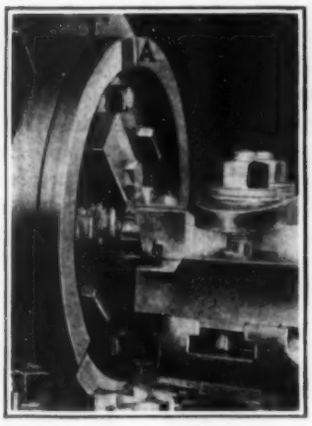
By running the tool at a slow speed 100 pieces can be produced in about 15 min. The work produced is uniform in size and the outsides of the pieces have a hard polished appearance. If the pieces are to have this polished appearance on the outside, it is necessary for the inside of the cutter opening to be free from chatter and tool marks, and to be highly polished. In addition, the opening should be slightly bell mouthed, so the leather will be compressed as the tool is fed into it.

IDEAS FROM PRACTICAL MEN

Relieving Ratchet Teeth in a Lathe

By Herbert F. Crawford

Relieving the faces of end-ratchet teeth is a rather unusual job for the lathe, but the illustrations shows how it is done in the shop of the Aeromarine Motor and



Figs. 1 and 2—Relieving end-ratchet teeth

Plane Co., Keyport, N. J. The ratchet forms part of a special starting device, and has but three teeth.

The cam *A* on the faceplate, Figs. 1 and 2, controls the action of the relieving tool, the carriage being forced toward the headstock by a heavy spring that holds a roller at the bottom of the tool slide against the cam at all times. The ratchet blank *B*, Fig. 2, is held in position against the faceplate by the short straps shown, being located so as to bring the teeth in the correct position with relation to the cam. Each tooth is located by a slot milled to depth, one side forming the face of the tooth, the space making the gap for the tool to end its cut and return before beginning the cut on the next tooth.

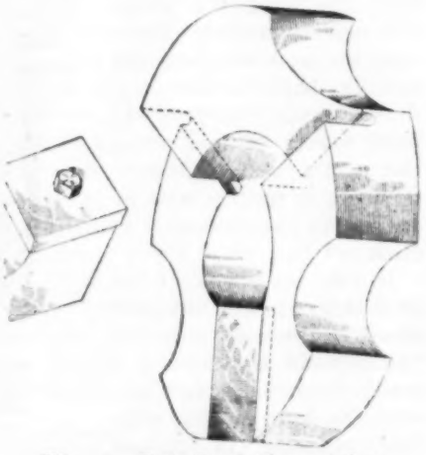


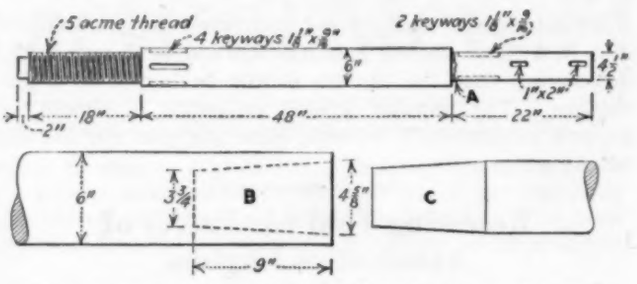
Fig. 3—Detail of the ratchet

Since the tool was above the center, it had to be set at an angle so as to be radial from the center and give the proper shape to the tooth. The device works very satisfactorily and produces ratchets at a good rate.

Repairing Broken Shafts

By E. W. Heinrichs
Lacoticas, Mexico

We have had quite a number of shafts in our ore mills to break from time to time, and, since our location was such that to have gotten new shafts or new material from which to make them would have meant serious delay, repairing them appeared to be the only alternative.



The broken shaft and the method of repairing it

The break nearly always took place at the point shown at *A* in the illustration. After facing the ragged end of the 6-in. part, it was bored taper as at *B*. The piece *C* was made and both parts shrunk together. The shaft was then put in the lathe, the new end centered and turned and a skim cut taken on the 6-in. part to reduce the swell due to shrinking the two parts together.

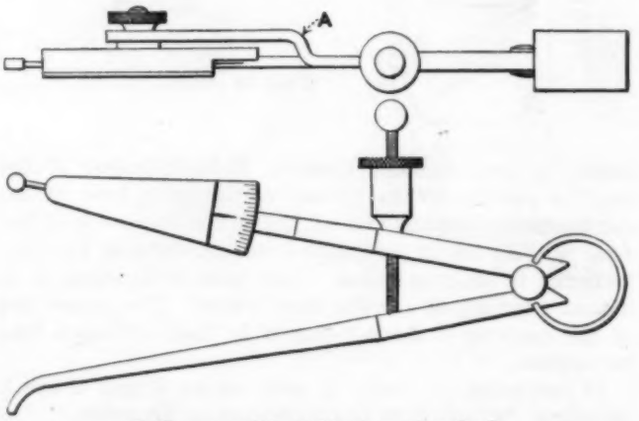
Cutting the two keyways and putting in the two slotted holes shown, completed the job. While these shafts have to stand lots of vibration and hard pulling, we have never had one of them to fail after being repaired in this manner.

Indicating Calipers

By Arthur R. Myers

The illustration shows a very handy tool than can be made by combining a pair of spring calipers and an Ideal indicator.

One leg of the calipers is offset, as at *A* so as to bring the contact points of the other leg and the indicator into the same plane. The offset leg is drilled to receive the



Calipers with indicator attached

stud on the back of the indicator, this instrument being attached thereto by a knurled nut in the manner shown. The indicator can be swiveled to any position desired.

The size of the hole calipered with this combination instrument can be accurately determined by checking the caliper setting by a micrometer.

Sizes of Standard Milling Cutters (Simplified Practice)

Involute Gear Cutters, Metric Sizes

Standard Hole, Standard Keyway

Module in Millimeters	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel	Size of Hole In.	Size of Hole mm.	Module in Millimeters	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-speed Steel	Size of Hole In.	Size of Hole mm.
½	1¾	1¾	⅞	22	4¼	3	3⅛	1	27
¾	1¾	1¾	⅞	22	4½	3⅛	3¾	1¼	32
1	1¾	1¾	⅞	22	4¾	3⅛	3¾	1¼	32
1¼	1⅞	2	⅞	22	5	3⅛	3¾	1¼	32
1½	2	2⅛	⅞	22	5¼	3⅛	3¾	1¼	32
1¾	2	2⅛	⅞	22	5½	3¾	4	1¼	32
2	2⅛	2¼	⅞	22	5¾	3¾	4	1¼	32
2¼	2¼	2⅜	⅞	22	6	3⅞	4¼	1¼	32
2½	2¼	2⅜	⅞	22	7	4⅛	4½	1¼	32
2¾	2¾	2¾	1	27	8	4⅜	4¾	1¼	32
3	2⅞	2⅞	1	27	9	5⅛	5½	1½	40
3¼	2⅞	2⅞	1	27	10	5½	5¾	1½	40
3½	2⅞	2⅞	1	27	11	5¾	5¾	1½	40
3¾	2⅞	2⅞	1	27	12	5¾	5¾	1½	40
4	3	3⅛	1	27					

1-in. or 27-mm. Hole, 5/32 x 5/64-in. Keyway

Module in Millimeters	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-speed Steel	Module in Millimeters	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-speed Steel	Module in Millimeters	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-speed Steel
¾	2¼	2¼	2	2⅝	2⅝	4	3	3⅛
1	2¼	2¼	2¼	2⅝	2⅝	4½	3⅛	3¼
1¼	2⅜	2⅜	2½	2¾	2¾	5	3¼	3⅜
1½	2½	2½	3	2⅞	2⅞	5½	3⅜	3½
1¾	2½	2½	3½	2⅞	2⅞	6	3½	3⅝

1¼-in. or 32-mm. Hole, 3/16 x 3/32-in. Keyway

1¼	2¾	2¾	2½	3	3	5	3⅝	3¾
1½	2⅞	2⅞	3	3¼	3¼	5½	3¾	4
1¾	2⅞	2⅞	3½	3⅜	3⅜	6	3⅞	4¼
2	2⅞	2⅞	4	3½	3½	7	4⅛	4½
2¼	2⅞	2⅞	4½	3⅝	3¾	8	4⅜	4¾

1½-in. or 40-mm. Hole, 5/16 x 5/32-in. Keyway

2½	3½	3½	5	4	4¼	9	5⅛	5½
3	3½	3½	5½	4⅛	4⅜	10	5½	5¾
3½	3⅝	3⅝	6	4¼	4½	11	5¾	5¾
4	3¾	3⅞	7	4⅝	4⅞	12	5¾	5¾
4½	3⅞	4⅛	8	5	5¼			

1¾-in. or 45-mm. Hole, ⅜ x 3/16-in. Keyway

3	4	4	5½	4½	4⅝	10	5⅞	6⅛
3½	4⅛	4⅛	6	4⅝	4¾	11	6¼	6¼
4	4¼	4¼	7	5	5¼	12	6½	6½
4½	4⅜	4⅜	8	5⅜	5⅝			
5	4⅜	4⅜	9	5⅝	5⅞			

Concave and Convex Cutters

[These cutters have formed teeth and can be sharpened without changing their outline]

Diameter of Circle	Diameter of Cutter	Size of Hole	Diameter of Circle	Diameter of Cutter	Size of Hole
⅛	2	⅞	½	2¼	⅞
3/16	2	⅞	5/8	2¾	1
¼	2	⅞	¾	3	1
5/16	2¼	⅞	⅞	3¼	1
⅜	2¼	⅞	1	3¼	1
7/16	2¼	⅞			

Stocking Cutters for Involute Gears

Standard Hole, Standard Keyway

Diametrical Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel	Size of Hole	Diametrical Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel	Size of Hole
*1	8½	8½	2	3	4⅜	4⅜	1¼
*1¼	7¾	7¾	2	4	3⅞	4¼	1¼
*1½	7	7	1¾	5	3⅝	3¾	1¼
1¾	6½	6½	1¾	6	3	3⅛	1
2	5¾	5¾	1½	7	2⅞	2⅞	1
2½	5½	5¾	1½	8	2⅞	2⅞	1

Note.—Cutters marked * are not kept in stock, but are made to order.

1-in. Hole, 5/32 x 5/64-in. Keyway

Diametral Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel	Diametral Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel
4	3½	3⅝	7	2⅞	2⅞
5	3¼	3⅜	8	2⅞	2⅞
6	3	3⅛			

1¼-in. Hole, 3/16 x 3/32-in. Keyway

Diametral Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel	Diametral Pitch	Diameter of Cutter: Carbon Steel	Diameter of Cutter: High-Speed Steel
3	4⅜	4¾	6	3½	3½
4	3⅞	4¼	7	3⅜	3⅜
5	3⅝	3¾	8	3¼	3¼

1½-in. Hole, 5/16 x 5/32-in. Keyway

2	5¾	5¾	4	4¼	4½
2½	5½	5¾	5	4	4¼
3	5	5¼	6	3¾	3⅞

1¾-in. Hole, ⅜ x 3/16-in. Keyway

1¾	6½	6½	4	4⅝	4¾
2	6½	6½	5	4⅜	4⅜
2½	5⅞	6⅛	6	4¼	4¼
3	5⅜	5⅝			

Cutters for Fluting Taps and Reamers

[These cutters have formed teeth and can be sharpened without changing their outline]

Cutter Number	For Tap Having Diam.	Number of Flutes	For a Reamer Having Diam.	Number of Flutes	Diam. of Cutter	Size of Hole
1	0– 1/8	4	1/8– ¼	6	2	1
2	5/32– ¼	4	5/32– 3/8	6	2	1
3	3/16– 5/8	4	3/16– ½	6	2⅛	1
4	7/16– 5/8	4	7/16–1⅛	6– 8	2¼	1
5	11/16– ⅞	4	1 3/16–1¾	8–10	2⅜	1
6	1 1/16–1¼	4	1 13/16–2	10	2½	1
7	1 5/16–1⅝	4	2 1/16–2½	10	2⅝	1
8	1 11/16–2	4	2 5/16–3	10	2⅞	1

(To be continued)

Punch here to suit your binder

Trim Line

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Variations in Springs from Calculated Figures

Q. In using the tables published in the standard handbooks pertaining to maximum spring loads and deflection per coil under the hood, can a spring be made to calculated diameters and be expected to give the exact results calculated?

A. The experience of a large manufacturer on this point is that the length will vary somewhat upon winding compression springs, that there will also be a variation in diameter and in pitch due to the variation in the stiffness of the material.

The company has also found, that in close-coiled tension springs, there will be a small variation in the diameter and length and that, when the spring is coiled with an initial tension, there is liable to be a variation in stiffness.

This variation has been found, in commercial practice, to range at 8 or 10 per cent, over or under, at the pressure which the spring is designed to carry for a certain deflection. It is entirely possible to manufacture to closer limits but the cost is materially increased. Reasonable allowances should therefore be made in all of the specified dimensions.

Approximate Lubricant Tests

Q. Please advise us of any comparatively simple tests to which we can put lubricating oils to help us in determining uniformity of grade and lubricating properties. We desire to test in a general way rather than to go into any great deal of detail.

A. To test for viscosity you can set up two sight-feed oil cups and, filling them with a grade of known viscosity, set the outlets so the same number of drops will fall from each in a given interval. Then without altering the openings empty one cup and fill it with the oil to be tested. If more drops fall from the oil being tested than from the test-standard oil the viscosity is less.

"Oiliness" is a property of oil that is very valuable. It is found in the vegetable and animal oils, usually, to a greater extent than in mineral oils. In fact the former are often added to the latter to make a blended oil of greater "oiliness" that is possible in the mineral oil alone.

To determine this property comparatively, with an oil assumed as a standard, set a sheet of glass at an angle and let a drop of each fall near the upper edge. That which travels the furthest along the glass in a given time is the best in this respect.

Resinification is a serious property of some oils that can be tested for with nitric acid. The oil is exposed to its fumes and, if pure, will form into a thick mass in a few hours, while if it is a resinifying oil it will remain thin.

Acids are injurious to bearings and can be detected in oil by the use of copper oxide. This is added to the oil in a glass vessel. If the oil is acid free, it will not change in color. If acid is present, it becomes bluish or greenish.

Impurities in solid form can be detected by smearing a piece of writing paper with the oil. A resulting transparent blot, uniform throughout, will indicate purity otherwise the solid particles will show.

Limiting Twist in a Line Shaft

Q. In the formulas for strength to transmit a given horsepower used in the design of a line shaft there is no time in which the length of the shaft nor the fact of a possible variation as to point of power imput is taken into account. The formula I refer to is $d = \sqrt[3]{\frac{53.5 \times hp.}{n}}$ *in which* d *= the diameter, and* n *= the number of revolutions per minute. Should not the amount of twist, which is a factor of the length, be taken into account?*

A. It is only necessary to take the twist into account when the resulting flexibility of the drive is objectionable from an operating standpoint. Some authorities hold that the twist should be limited to not exceed 5 min., or 0.08 deg. per ft. of shaft length.

While it is not necessary, so far as shaft strength is concerned, you can use the formula in which $d = 4.6 \sqrt[3]{\frac{hp.}{n}}$ to obtain this result. The shaft indicated will be larger than is required for strength alone.

A Gas-Fired Forge

Q. Please inform us how to build a machine-shop forge using natural gas as a fuel. This forge is for general-purpose work to replace a coal forge.

A. Crudely, such a forge resembles a brick box with a covering arch and is built to the size you require; with a door at the front, a flue starting, preferably, from near the floor at the rear and passing out of the box up the back wall, and one, or more gas burners of approved design with a small blower to supply air.

We believe it will be to your advantage to get in touch with companies in this field who will be in position to supply you with a complete furnace, as well as the burner and blower, for there is little economy, even with cheap fuel available, in not taking advantage of the furnace builder's varied experience.

In the event that you desire to purchase only the burners and blower, the information you can obtain from these companies will be of assistance to you in the furnace construction and we believe they will be glad to assist you to obtain just what you want.

Technical Abstracts

Tolerances and Clearances

Chief Engineer v. Gramenz, of Berlin, gives a review of the tolerance and clearance systems of England, Germany, Italy and Sweden as they have now been agreed upon. In all cases there is a tendency towards the unilateral system, although it has not yet been definitely adopted. In England the standards have, however, been so arranged that a transition can be made from the bilateral to the unilateral system in the easiest possible manner. By means of graphical charts the writer is able to scrutinize and compare the systems of the different countries in a very concise and yet comprehensive way.

The general impression gained is that the German tolerances and clearances are somewhat smaller than the English and that, in certain cases at least, the Swedes demand an even higher accuracy than the Germans. The Italians, so far, have not generally worked to any tolerance system and their new standards are based entirely on the basic shaft. The other countries have a basic bore as well as a basic shaft. The reviewer comes to the conclusion that after the adoption of these standards it will be possible to use together parts from different countries.

He is especially gratified with the fact that English standards are for the metric system no less than for the English system of units. All countries except France and England use 20 deg. C. as the normal temperature. France uses 0 deg. C. and England uses 62 deg. F. or 16⅔ deg. C.—*Zeitschrift des Vereines deutscher Ingenieure*, Nov. 7, p. 1411.

Casehardening

Too much attention cannot be paid to the selection of a suitable steel for casehardening, according to F. W. Rowe, of England. For most casehardened work, a plain carbon steel of low carbon content is the most suitable and economical material, and for work requiring a stronger core and where simplification of heat-treatment is desirable, alloy casehardening steels are used. The most commonly used are nickel steels, including chrome steels the most popular of which is 3 per cent nickel steel.

In discussing carburisers, Mr. Rowe states that the ideal equipment should give: first, high rate of penetration; second, a case containing not over 0.90 per cent carbon; third, maximum thermal conductivity; fourth, uniform penetration; fifth, good mechanical support to the work during carburisation; sixth, absence of clogging or sticking; seventh, absence of blistering; eighth, no tendency toward a sharp line of demarcation between case and core, and ninth, no shrinkage or deterioration in use.

Perhaps the most common fault with commercial carburisers is that a rapid rate of penetration is obtained at the expense of a case which is too high in carbon. This generally gives, also, a sharp line of demarcation, a defect the seriousness of which is insufficiently realized. —*The Automobile Engineer* (*England*), Nov., 1925, p. 426.

The Question of Equipment and Management

Foremen, as a general rule, welcome new machinery and equipment in their department. A good foreman, however, will check up on the equipment already available, to make sure that satisfactory work could not be performed on the existing equipment if properly handled. A great deal of money is tied up in over-equipping plants and increasing costs in this manner. When new equipment can produce at a cheaper rate than old equipment and the investment in new equipment can be repaid within a reasonable time, it should be bought by all means but a real investigation into costs should always be made. Sometimes it is found that by providing additional tooling the existing equipment is ample for the increased output required. Unless the equipment is reasonably well employed, because the output demands that it run most of the time, decreased production time may not mean decreased costs, because the overhead charges due to the investment in the new equipment may consume the profits.

Common sense management takes advantage of the curiosity of the worker by presenting the possibilities of his job to him in such a way that he will be anxious to demonstrate to his own satisfaction whether or not there is any foundation for the claims made for given tools or methods. If production is increased he will, of course, also expect it to have some effect on his own earnings in the way of reward.—*Machinery*, Nov., 1925, p. 210.

Acetylene Gas in Steel Foundry Practice

That the present day steel casting manufacturers cannot afford to take any chances on losing even one casting on account of not being solid throughout due to imperfect heading and gating, says R. W. Thomas, superintendent of the Vulcan Iron Works. Formerly it was necessary to remove these by means of a circular saw, and the removal depended largely on the position of these headers. Now acetylene usually can go through any header or gating and it is possible to place these headers in a position where they can do most good to the casting.

Another place where steel foundrymen are today making a great deal of use of the acetylene cutting torch is in flask fitting. There are a number of steel foundries that equip their flask fitters with an acetylene cutting outfit. One of the group is trained in cutting sufficiently to handle all necessary cuts contingent to flask building, fitting and repairing. It is essential that the flask must be fitted to suit almost each pattern as it is received but in the majority of cases alterations of some degree are necessary. Further, Mr. Thomas has made beneficial use of the acetylene cutting torch to remove scrap from flasks.—*Iron Trade Review*, Nov. 26, p. 1345.

American Machinist

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KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Run of the Shop

"I LET that machine tool salesman have the run of the shop. Why? Because he has made me acquainted with equipment and given me ideas that have helped greatly in reducing my production costs."

The quotation is not literal, but is, in effect, the statement of the superintendent of a big plant. Freedom of the plant! What an enviable situation among salesmen. And it is reached as a reward for value given.

Back of that success was the knowledge of the field and the willingness to work primarily for the interests of the customer that are included in a true definition of selling engineering service in selling machine tools. The successful salesman on some visits buys instead of selling. What he buys is good will—what he gives for it is engineering service—and he has done a fine job when finally he has reached the point where he has the run of the shop.

Why So Many Brasses?

ONE of the projects now before the Department of Commerce is the simplification of the number of alloys of commercial metals as called for by various specifications, along the line of the work done by their Division of Simplified Practice. That there is an opportunity for great economies in the line can hardly be questioned. And, like charity, simplification can begin at home, i.e., in this case, in the government itself.

Taking item 645.9 of the National Directory of Commodity Specifications, we find that the Navy Department has twelve specifications for brass for miscellaneous manufactures. They begin with brass for steam boat chains and end with grommets. In between are specifications for spittoons, brass beds, scissors trays, toilet paper holders, bottle openers, etc. Just why a special specification is necessary for spittoons and scissors trays is difficult to see.

The Commerce Department itself has four specifications; the Treasury Department five, and the War Department seven. Of the latter, one is for fixtures for paper towels and another for chandelier chain. One of the Treasury Department's specifications is for cuspidors, thus placing itself a notch higher in polite society than the Navy.

It is quite probable that many of these specifications are never insisted upon and that the purchasing officer uses discretion the same as in commercial life. But as long as these specifications exist they can be demanded and as many as possible should be discarded in order to simplify matters for everybody concerned.

The New Revenue Bill

UNTIL the new revenue bill receives the President's signature it is possibly unwise to make any very protracted comments on it. Its rapid progress as a non-partisan measure, however, leads one to believe that any changes that may be made in it will not be of great moment.

Of considerable interest to business men is the fact that the rate on corporations remains at 12½ per cent while the highest normal individual tax is reduced to 5 per cent. Isn't this a rather strong incentive for corporations to reorganize as partnerships? As one authority puts it, the federal income tax has become in fact a heavy business income tax on corporations as well as a personal income tax.

The provision for the establishment of a "Joint Commission on Taxation," if it passes unchanged, is a very hopeful one. With the present chaotic conditions surrounding the relations of federal and state taxes such a commission has great opportunities for valuable work. If it is permitted to function, future tax measures will undoubtedly be more wisely drawn than those of the past few years.

Is Engineering Education Too Technical?

ISN'T it true that engineers should be better educated? Better grounded in fundamentals when they leave college? Taught less of the strictly technical and more of the scientific and cultural, of economics and accounting?

The report, at the annual meeting, of the A.S.M.E. study of mechanical engineering education, shows that a majority of the engineers questioned when the study was under way, believes that those changes should be made.

Under existing curricula in engineering schools many strictly technical subjects are covered. Their value as mind trainers is admitted, but many of them must be forgotten as the young engineer takes on his first and then succeeding jobs.

If, instead, he should be given a good training in the scientific fundamentals, he would be able to acquire the knowledge of individual technical subjects as he needed it. A revision of engineering education along the lines indicated would put more engineers into business, whereas now they are held back by their lack of knowledge of the financial, economic and cultural phases of industry.

Shop Equipment News

Morton Roll-Wabble Planers and Shapers

The Morton Manufacturing Co., Muskegon Heights, Mich., is building the roll-wabble planer, illustrated in Fig. 1, and the pillar-type roll-wabble shaper shown in Fig. 2. Both machines have a long base to accommodate large rolls. For convenience in shipping, the bases of the machines are made in two sections, the support for the rolls, illustrated in Fig. 2, being detachable from the bed of the machine.

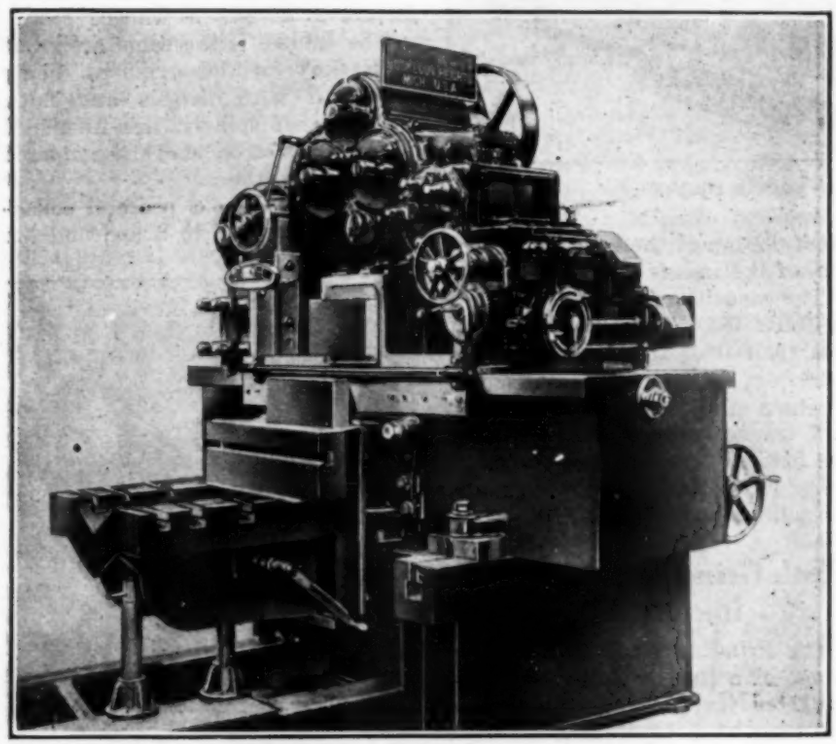


Fig. 1—Morton Roll-Wabble Planer

The bases of both machines are provided with flat rail bearings on which the outer support for the roll can be adjusted to any desired position. The center rib is provided with rack teeth to brace the end support and to care for the end thrust on the roll during the machining.

The bed proper of the planer is trunnioned to the base of the machine so that it can be swivelled in either direction to give a taper of 1½ in. to the foot, if necessary. It is of heavy box construction, and has square rail bearings on top. The head unit of the machine moves horizontally along the bed and is equipped with power feed and traverse. A plate with vertical square rails to carry the angular knee or table is bolted to the front of the bed of the machine, as shown.

The table is rigidly constructed and is provided with a machined V-surface for supporting the neck of the roll. It is also provided with T-slots on the upper surface, for clamping bolts or tie rods. The vertical end of the table has a horizontal T-slot so that bolts can be used for holding the rolls against the cutting strains. The table is adjusted vertically to accommodate various sizes of rolls by means of a revolving screw that works against a ball thrust bearing. The screw is hand-operated through bevel gears. An auxiliary screw is also provided which serves as an outer bearing for the knee, helping to bear the weight of the roll.

The outer V-block is a steel casting, tongued and fitted in T-slots that run horizontal in the base in order to insure alignment. Both sides of the frame are provided with square slots so that the V-block can be adjusted to the proper position. Provision is made for clamping the neck of the roll.

The travelling head column is a box section, and is heavily ribbed for strength. Special angular gibs are provided to take up the wear of the rail bearings. All running journals are bolted to the column rigidly. The feeding and operating mechanisms are self-contained in the travelling head and move with it.

The ram is a square, hollow-bored, high-carbon steel forging machined and ground. The rack is cut from the solid and a bronze strip is inserted centrally with the rack face, forming a continuous bearing. The wear is taken up by means of adjustable taper gibs on the side and the top of the ram. The end is threaded to receive the cutter head secured to it.

The cutter head is made of steel. Its base is threaded to the end of the ram and held by means of a clamp. The slide is fitted to the base of the cutter head and has V-bearings with adjustable gibs. In addition the head also has tapered steel side plates with square rail bearings. The wear of the head-adjusting screw can be taken up. The usual side locks are provided on the head, and a swivel on the adjustable slide. Double binders and bolts accommodate tools up to 2x2½ in. in size.

The reciprocating motion of the ram, the stroke of which is 32 in., is obtained by means of friction clutches and compound disks. They are placed in a chamber inside the column. A clutch is provided to start and stop the machine independent of the motor which drives it. The reversing mechanism for operating the clutches on the recipro-

SHOP EQUIPMENT NEWS

cating stroke has a sliding bar and revolving cam. All small parts are casehardened.

The stroke is adjusted by means of tappets on a circular disk and adjustments can be made while the machine is running. It can be reversed at will, by means of a lever.

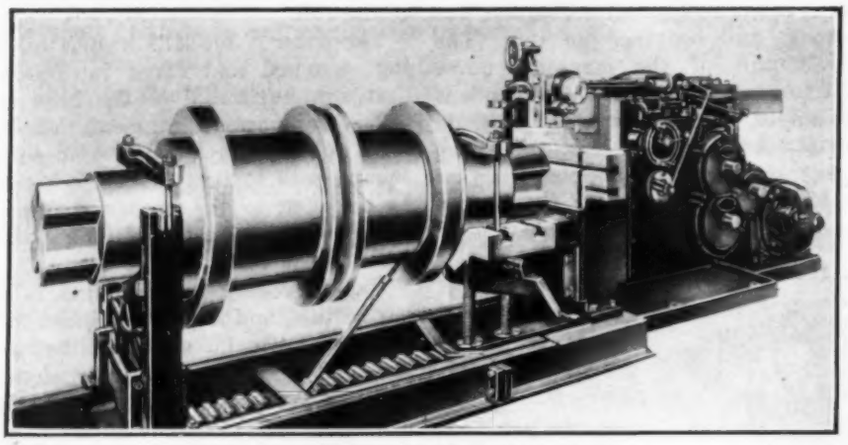


Fig. 2—Pillar-type roll-wabble shaper

The feed is by friction and it is said that since it operates at the extremity of the return stroke, the tool will not drag on the cut.

The clutches have friction surfaces that are flat with a revolving disk. The compression is obtained by means of sliding collars and compression levers that have adjusting setscrews to provide for wear. The flat disks can be refilled and the material used will not injure the metallic surfaces in the clutches.

The main driving pinion is a steel forging with teeth cut from the solid. Steel gears are used wherever they are subjected to a heavy cutting strain. They are inclosed in dust-tight compartments. The shafting is made from steel, keyseated and ground. The 10-hp. motor is attached to a bracket on the rear side of the head and has a variable-speed controller.

A splash system of oiling is used for the clutches and all shaft journals that are subjected to heavy strains. The oil is supplied from a reservoir to the ram by means of a rotary pump that operates only when the machine is running. The oil for the ram is distributed to sight-feed lubricators and the overflow lubricates the journals. All gearing runs in a bath of oil. The friction clutches and disks run in oil and the starting and stopping clutch is of self-lubricating design.

The length of the bed of the machine is 6 ft. The planer can handle rolls 14 ft. long, 56 in. in diam., and with necks 28 in. in diam. The greatest longitudinal feed of the column is 16 in. while the feed of the head can be 10 in. The distance from the top of the ways to the bottom of the ram is 50 in.

The capacity of the shaper, which is illustrated in Fig. 2, is somewhat less than that of the planer. The principles of operation are similar to those of the planer, but the feed and transverse mechanisms are in the base of the machine.

Other sizes of the machines than those described can be built to order.

Roth Grinding and Polishing Machine

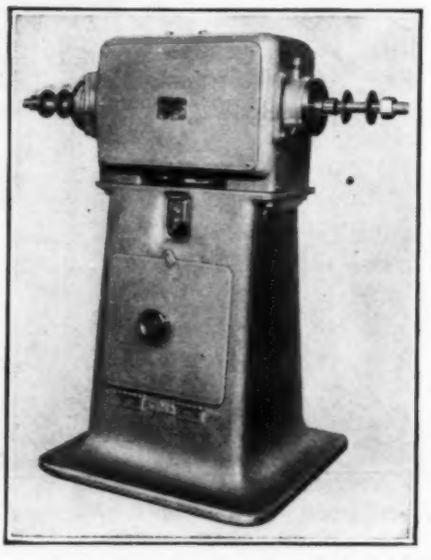
The grinding machine illustrated is one of a line of equipment being marketed for general grinding and polishing work by Roth Brothers & Co., 1400 West Adams St., Chicago, Ill. Motors for either a.c. or d.c. current are available, the complete line comprising pedestal and bench types.

The motor is mounted inside the rectangular housing, and its bearings are set forward from a center line to provide greater clearance for work that projects beyond the wheel. Covers are arranged to provide a means of access to the motor as well as to the starting apparatus which is located in the base. There is a rheostat on the d.c. type and a push button switch, making together an assembly to which it is only necessary to connect the leads from the shop circuit. Air is admitted through ducts in the base for cooling purposes. All parts in the upper housing are fully protected from dust.

The principal difference between the grinding and the polishing units lies in the speeds and in the design of the spindle. The pedestal type grinders range from 1,000 to 1,900 r.p.m. in three steps, while the d.c. polishers range from 2,100 to 2,800 in three steps. The a.c. pedestal polishers are made in nine sizes, ranging from 1,800 to 3,600 r.p.m., and the grinders are three in number, ranging from 1,200 to 900 r.p.m. as the motor size is increased. There is one size of bench-type d.c. polisher at ½ hp. and 2,600 to 3,400 r.p.m. It carries an 8x¾-in. wheel.

The spindle is the same design at both ends on the grinders, being furnished with flanges and nuts. The polisher spindles are furnished with flanges on one end and a tapered shaft on the other.

In power, the d.c. pedestal polishers range from 3 to 8 hp., and the



Roth Pedestal Type Grinding Machine

d.c. pedestal grinders from 2 to 5 hp., the a.c. pedestal polishers range from 1 to 10 hp., and the a.c. pedestal grinders from 3 to 7½ hp. Those in the a.c. current, at 7½ hp. and larger, have automatic starters.

The maximum sizes of the wheel which can be driven from these grinders and polishers are dependent upon the horsepower and cover practically the full range of uses to which such a machine can be put.

SHOP EQUIPMENT NEWS

Edlund Carbon-Drilling Machine

The Edlund Machinery Co., Inc., Cortland, N. Y., has recently completed construction on a machine particularly designed for high-speed drilling of carbon. The arrangement illustrated in Figs. 1 and 2 adapts it for use on carbon electrodes for electric furnaces. These electrodes vary from 4 to 6½ in. in diameter and measure approximately 14 in. in length. There must be a tapered hole drilled into one end to receive a correspondingly tapered copper bar which conducts the current. The taper is produced by using a flat-steel, tapered drill.

The work is held vertically in jaws at the top of the machine that are actuated from a pneumatic piston and cylinder mounted behind the column, as shown in Fig. 2. The drill is advanced vertically from below, an arrangement that eliminates any difficulty in getting rid of the carbon dust and that permits rapid work and clean, exact results.

The slanting fixture, shown at the front in Fig. 1, is to assist in handling the work expeditiously, and coupled with the automatic feed and reverse and the interlocked gripping movement, permits of high-speed production.

The drive is taken from any source of power through a belt to a tight and loose pulley at the rear of the machine, a shifter for this drive being located conveniently for the operator. The power is transmitted to the spindle drive through hardened alloy-steel gears located within the base.

A geared branch from this main drive through bevel gears, a clutch and a worm and wormwheel furnish power for the drill feed. The male member of the friction clutch is faced with fiber and is double-keyed to the feed pinion. These springs are used to hold the female member in engagement when the clutch is thrown in, while a brake arrangement retards the overhauling tendency on the part of the drill spindle when it is allowed to return from the top of its stroke.

The main operating lever is shown in Fig. 1 above the belt shifter. This lever is connected so that when it is pulled forward the cylinder is operated to cause the jaws to grip the work, the feed clutch is engaged and the drill starts into the work. Upon reaching the top of its stroke, a trip lever is actuated automatically to release the feed clutch and allow the spindle to return. At the same time, the cylinder draws the chuck arms open and the work is released to slide down the fixture at the front. The machine is then ready for the next piece.

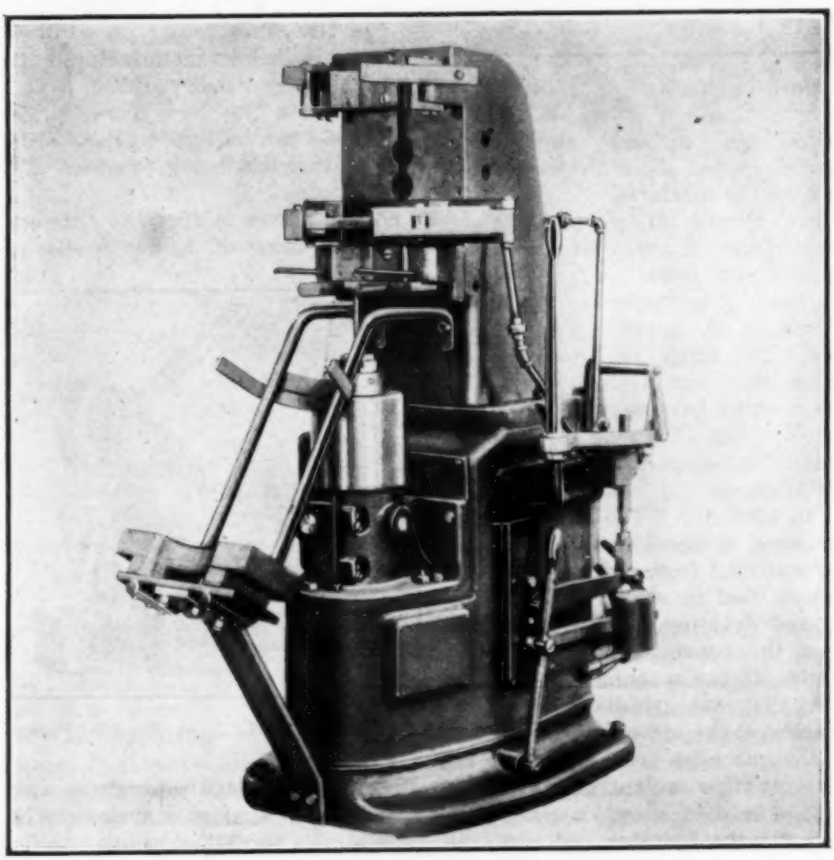


Fig. 1—Edlund Carbon-Drilling Machine

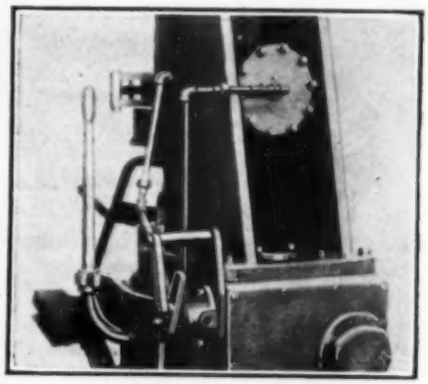


Fig. 2—A rear view showing the chuck cylinder

The drill is held in a clamping device that sets into and is, in turn, driven by the spindle. This device is designed so that it is a simple matter to release and remove the drill or to change its position lengthwise. When tightened, however, there is no chance of slippage of the drill in the wedge-shaped collet jaws.

There is a protecting cap over the spindle end to protect the bearings from entrance of the carbon dust, and an exhaust system is arranged to take the dust away as it forms.

Lubrication of the parts inside the base is provided by a pump installed to take oil from a reservoir at the bottom of the base and pump it to flood every moving part. Pipes lead from the pressure line, in addition to this flood, to lead the lubricant to any bearings that are not effectively immersed in the cascade of oil.

The machine occupies a floor space of approximately 2x4 feet.

SHOP EQUIPMENT NEWS

Gardner Disk Grinding Machine 53-Inch, No. 24

The No. 24, 53-in. disk grinding machine built by the Gardner Machine Co., Beloit, Wis., is an addition to its line, models of which were described on page 962, Vol. 47 and page 718, Vol. 63, of the *American Machinist*. The machine, illustrated, is adapted to both wet and dry disk grinding as may be required. It is operated by means of a vertical direct-connected motor. This arrangement eliminates belting, pulleys or gears and consumes a minimum amount of floor space.

Gardner Disk Grinding Machine, No. 24

The frame of the motor itself serves as the pedestal of the machine, its base being the upper end plate of the motor. The disk wheel is 53 in. in diameter and travels in a horizontal plane. The disk is mounted on a supporting wheel-collar 20 in. in diameter. The collar is taper-fitted to the upper end of the rotor shaft of the motor, which forms the driving spindle of the machine. A cast-iron guard ring is fastened to the top of the base, to which can be secured workholders or a dressing device.

The construction of the motor frame is such that the air circulates through it without circulating through and around the rotor or stator windings. The cool air is drawn up through openings in the base of the grinder by means of fan blades mounted on the under side of the disk wheel. After circulating around the frame of the motor it is forced out through eight holes equally spaced about the circumference of the machine.

The spindle of the machine is made from crucible steel. It is mounted on radial and thrust ball bearings. The upper radial bearing is said to be capable of carrying a load eight times as great as that which the machine sustains. The lower radial bearing is a single-row annular ring. The end thrust bearing which supports the spindle is self-aligning and contains balls 1¼ in. in diameter. The bearings run immersed in thin lubricating oil and are protected from grit and from the coolant used in wet grinding. Filling and draining pipes are provided from the bearing housings to the outside of the machine.

So that wet grinding can be accomplished the upper or body portion of the machine is a reservoir for water or other coolant. This portion is so shaped to allow knee and foot room for the operator and is not an integral part of the casting for the motor head. The reservoir has a capacity of 55 gal. of coolant. The eight hand holes in the bottom of the machine can be used for cleaning out the sludge. Each hole is drilled and tapped so that a water drain can be applied to the most convenient of them. A coolant overflow is provided so that the grinding compound will not get into the spindle bearings. A motor-driven pumping unit can be supplied for attaching to one of the hand-hole covers.

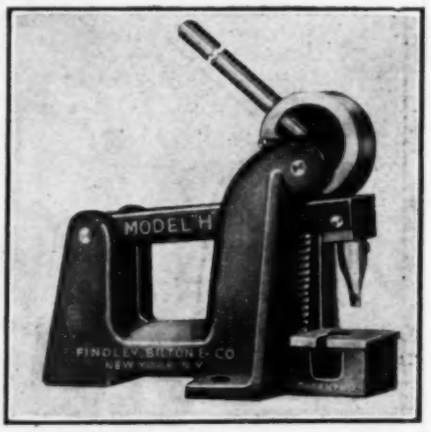
When the machine is used for dry grinding, the coolant reservoir serves as a breeching for the exhaust system. In this case one of the hand holes is used to form a connection between the exhaust and the internal breaching.

An alternating-current motor is furnished with the machines as standard, but they can be built for a direct-current motor when desired. The machine weighs about 4,400 lb. and requires 10x10 ft. of floor space.

"FinBilt" Tire-Chain Repair Press

The tire-chain repair press, illustrated, is being manufactured in three sizes by Findley, Bilton & Co., 2 West 45th St., New York, N. Y. The press can be bolted to any shop bench, through holes provided for the purpose.

The machine is operated through a cam by means of the handle shown.



"FinBilt" Tire-Chain Repair Press

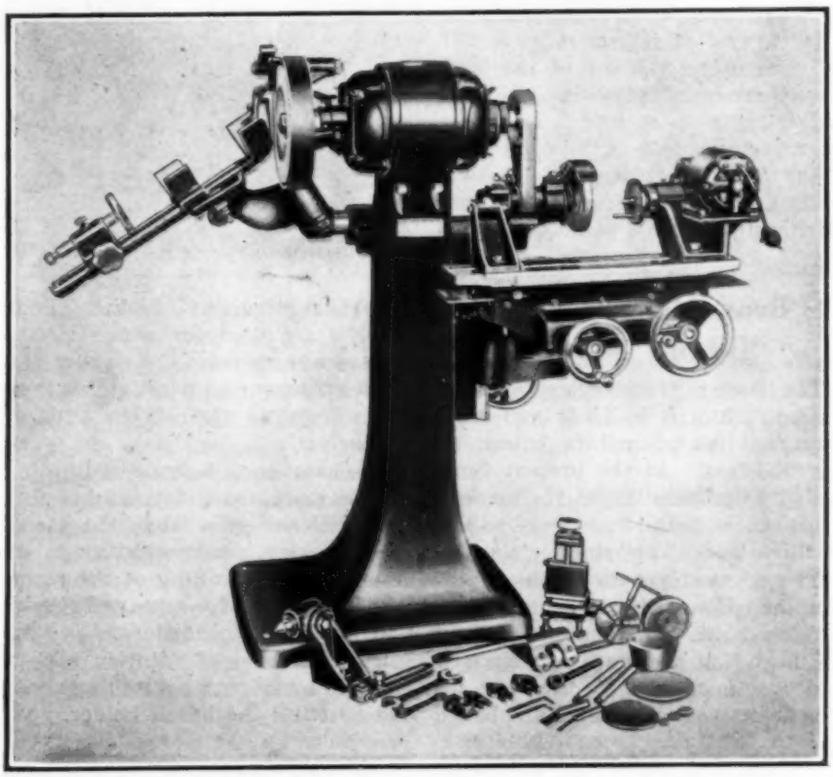
Pressure is exerted against the arm which bears against a spring. The arm carries two attachments, one for spreading the chain links and the other for closing the open links.

SHOP EQUIPMENT NEWS

Gallmeyer & Livingston Combination Drill, Cutter and Reamer Grinder, Motor-Driven

The Gallmeyer & Livingston Co., Cedar Rapids, Iowa, has redesigned its combination drill, cutter and reamer grinder to provide for a motor drive and to eliminate the overhead structure, as illustrated. The universal tool and cutter grinder was previously described on page 981, Vol. 60 of the *American Machinist*.

The motor used for driving the machine is fully inclosed to prevent the entrance of dust. Convenient removable hand-hole covers are provided so that bearings can be adjusted or the commutator cleaned when it is deemed advisable.



Gallmeyer & Livingston Combination Drill, Cutter and Reamer Grinder, Motor-Driven

The drill-grinding wheel, as can be seen, is mounted directly on the armature or rotor shaft, and a special bearing has been provided to eliminate end play. The illustration shows a drill holder with a capacity of from ¼ to 2½ in. in diameter, but holders can be provided for various capacities as may be required. The machine has a diamond truing device and a safety stop.

The other end of the motor is utilized for driving the cutter and reamer grinding-wheel spindle. It is driven through an endless belt and is provided with a suitable ratio of pulley sizes to allow for the increased speed necessary in the case of smaller diameters of wheels used for cutter and reamer grinding work. Either straight or cup wheels can be used and the machine will handle straight or taper work in either case.

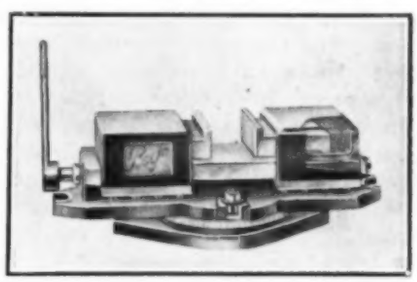
The longitudinal, transverse and vertical movements are controlled by means of convenient handwheels. The maximum capacity is for work 9½ in. in diam. and 20 in. long. There is a longitudinal movement of 15 in., a transverse movement of 7 in., and a vertical movement of 6¾ inches.

For handling cylindrical and internal grinding work, a special motor has been provided. The motor can be powered from the ordinary lamp circuit and is mounted integrally with the headstock. The workspindle is driven through a worm to provide the slow speed necessary and to eliminate the necessity for an overhead drum.

"Berjo" Flexible-Jaw Vise

F. W. Jaeger, 140 Liberty St., New York, N. Y., is marketing in this country the "Berjo" flexible-jaw vise which is being imported from Austria. The face of each jaw is segmented, as illustrated, so that the teeth will take the form of the piece to be clamped. Parallel-sided, as well as contour pieces, can be gripped in the vise.

The teeth are backed up by a quantity of small balls held in a chamber in each jaw housing. They can be pressed like a fluid to allow for the variation in the alignment of the teeth.



"Berjo" Flexible-Jaw Vise

When the jaws are opened after clamping, the teeth will retain the contour of the pieces until the jaws have been opened to a point approximately half the maximum. They are then automatically re-aligned in a straight row. Both jaws move in or out simultaneously.

The vises are built in three sizes, Nos. 1, 2 and 3, with widths of about 3½, 5 and 7 in., respectively. They will open to distances of approximately 4, 4¾ and 6 in. The weights are 48½, 77 and 143 lb., respectively. Swivel bases can be furnished for each of the sizes when this additional part is specified.

SHOP EQUIPMENT NEWS

Landis Pipe-Threading and Cutting Machine, 8-Inch

The Landis Machine Co., Waynesboro, Pa., has added to its line of pipe-threading and cutting machines, the 8-in. size illustrated. The machine is similar in design and construction to the 6-in. size described on page 217, Vol. 62, of the *American Machinist*. Fig. 1 shows the operating side of the belt-driven model, while Fig. 2 is a rear view of the motor-driven machine. The range of this machine is from 2½ to 8 in. inclusive. Two die-heads are used to cover the range, one die-head being for work 2½ to 4 in. in diam. and the other for a range from 4 to 8 in. Landis stationary die-heads and "long-life" chasers are used.

The machine is driven through a gear box that provides eight variations in speed. It is located beneath the main spindle. A reverse drive located in the gear box is used for putting on and taking off flanges. The reverse is controlled by a lever within a convenient reach of the operator. The gears are cut from steel. The front and the rear gripping chucks have universal adjustment and are self-centering in reference to the pipe. The rear chuck is equipped with flange grips for screwing the flanges on or off the pipe. Both chucks are three-jawed. The cross-rail supports the die-head which at the rear is fitted with centering jaws, cutting-off tools, a reaming tool and a length gage.

The machine is easily adapted for motor drive and the motor can be applied after the machine is in service. The motor is mounted on a plate over the gear box and drives through a silent chain. A 10-hp., constant-speed motor, wound for an approximate speed of 1,200 r.p.m. is required.

The die-lubricating system includes a rotary pump, a by-pass for the surplus oil and a special control valve at the rear and at the cutting-off tools. The gears run in a bath of oil, the shaft bearings are lubricated automatically by means of a forced-feed system. The main bearings are lubricated by means of flat link chains running in oil reservoirs.

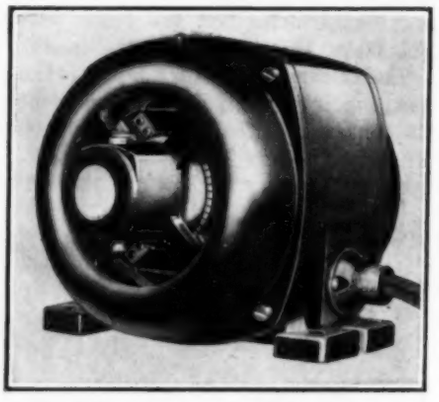
The travel of the carriage is 24¾ in. The driving pulley of the belt-driven machine is 14 in. in diam. and takes a 5-in. belt. The floor space required is 9 ft. 3 in., by 4 ft. 9¾ in. The belt-driven model weighs 9,750 lb. and the motor-driven machine weighs 10,500 pounds.

Brown-Brockmeyer "B-Line" Motors

The Brown-Brockmeyer Co., Inc., Dayton, Ohio, is building and marketing a line of motors known as the "B-Line." At the present time, ½- and ¾-hp. sizes are on the market, while others, both larger and smaller, are to be placed in production shortly.

The motors operate on the repulsion-induction principle and are sturdily built. The head covers and the field ring are made of cast iron and are machined to accurate fit. The field core is completed and baked as a separate unit and is then pressed into place. The bolting feet are integral with the field ring. Ventilation is assured by the installation of a fan on the rotor and large air ducts between the field core and the ring. Dust caps are fitted into the end covers.

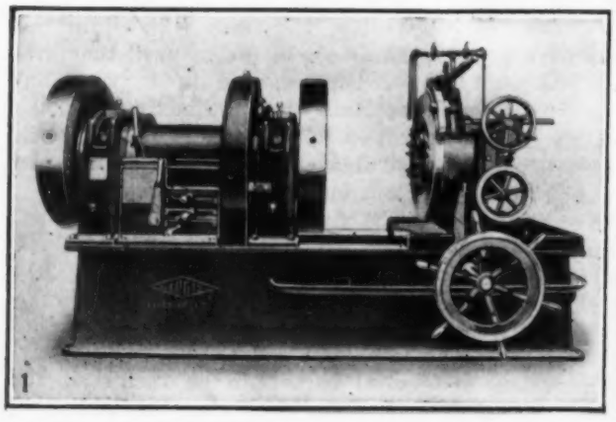
The armature shaft is ground to size. It is larger at the bearings than at the shaft extension. The commutator is recessed to receive the short-circuiting device. Four brushes are used for which slotted holders are provided. A spring and lever arrangement maintains a uniform pressure against the brushes themselves.



Brown-Brockmeyer "B-Line" Motor

The bearings are made of Bunting bronze, machined and ground to size. Lubrication is effected by the use of yarn wicking communicating to oil reservoirs. One filling of the reservoir is sufficient for a year of service under ordinary conditions.

The direction of rotation can be changed by loosening a locking screw and shifting the brush holder.



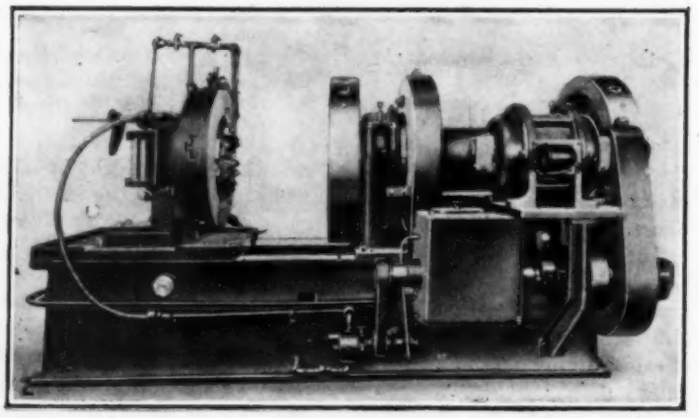
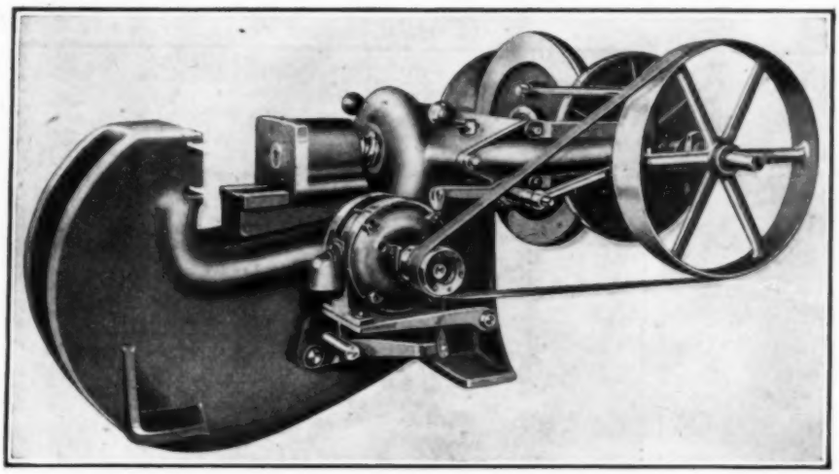


Fig. 1—Landis Pipe-Threading and Cutting Machine, 8-Inch. Fig. 2—A rear view of the motor-driven model

SHOP EQUIPMENT NEWS

Zeh & Hahnemann Percussion Power Press, Horizontal, No. 16-10

The line of percussion power presses manufactured by the Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J., has been increased by the addition of the horizontal power press No. 16-10. This model is similar in construction to the vertical models described on page 605, Vol. 59 and on page 527, Vol. 60, of the *American Machinist*. It is designed to meet the needs of plants engaged in the manufacture of industrial railways. The horizontal arrangement is to permit the work to pass freely through the press for riveting operations when the work is suspended from a runway.



Zeh & Hahnemann Percussion Power Press, Horizontal, No. 16-10

The capacity of this model is for a pressure of 100 tons and several rivets can be headed cold at each stroke of the machine. It is controlled by a treadle and stops at the end of the reverse stroke where it is held by means of a brake. Since it is the work or the die that terminates the working stroke of the press, an emergency stop, the lever of which can be seen in front of the flywheel, has been provided in case the empty press should be tripped. The machine can be operated either by means of an individual motor drive or by belt. The power is transmitted through a shaft that is 2¼ in. in diam. outside and 2½ in. in diam. inside through the disks to the main disk flywheel. The disks and the flywheel are 30 in. in diam. The momentum of the ram is increased as the turning of the screw draws the flywheel further out on the radius of the friction disks.

The screw is 5½ in. in diam. and turns in a manganese-bronze sleeve-nut that is held in the frame by means of three lugs and a nut. The screw works against a hardened steel plug in the head. S.K.F. ball bearings are used throughout the machine.

The stroke of the press is 10 in. The die space is 7 in. deep and the throat is 12 in. A 5-hp. Allis-Chalmers motor is used for driving the machine at 200 r.p.m. The motor bracket is on a swivel to act as a belt tightener.

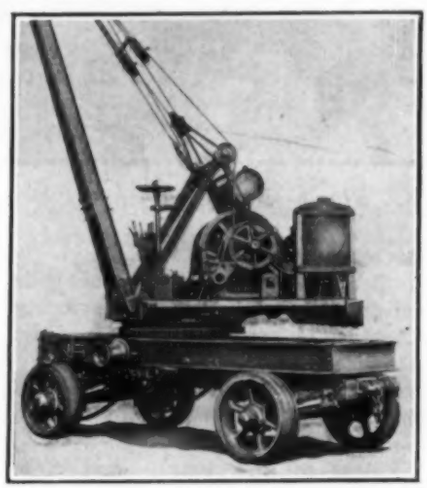
Harnischfeger Truck and Trailer Crane, Model 203-A

The model 203-A truck and trailer crane, illustrated, is being marketed by the Harnischfeger Corporation, 38th and National Aves., Milwaukee, Wis., for handling a ½-yd. clamshell bucket, crane hook or electric magnet.

All three drums are mounted on one shaft so that all the main machinery could be located behind the center pin. The short-tail swing of 7 ft. 1½ in. and the over-all width of 8 ft. 4 in. permits work in close quarters.

The revolving frame and drum-bearing frames are of cast steel. The motor clutch is of the twin-disk type, fully inclosed, and supported on ball bearings. All gears are of steel and have cut teeth. Drum clutches and brakes are of the outside band type and can be adjusted and removed.

The machine is driven by a four-cylinder, 40-hp., motor mounted at the rear of the revolving frame. The two main drums are controlled by independent clutches and brakes and both drums revolve at the same speed so that a clamshell bucket can be used without special attachments. The boom hoist is driven through planetary gears at a line speed of 62½ ft. per min. A self-locking connection is provided to prevent lowering at a speed in excess of 125 ft. per min. This boom hoist can be operated with, or independent from, the main drums and swinging machinery. Both the truck and the trailer cranes are provided with jacks that screw down against the rear wheels to relieve the springs from strain while the crane is in operation. A power driven capstan is mounted on one side of the body.



Harnischfeger Truck and Trailer Crane, Model 203-A

The trailer cranes are provided with a mechanism so that they can be propelled at a speed of 1½ mi. per hr. A 5- or 7½-ton truck can carry the crane. The total weight of the machine is 13,000 lb. and it can handle 10,000-lb. weights at a 10-ft. radius. The boom is 25 ft. in length.

SHOP EQUIPMENT NEWS

Besly Automatic, Piston-Ring Grinding Machine

The No. 6-20-I wet, belt-driven, disk-grinding machine, manufactured by Charles H. Besly & Co., 119 North Clinton St., Chicago, Ill., has been adapted and equipped with an automatic sliding-feed fixture for rough-grinding, simultaneously, both sides of piston-ring castings. The machine, illustrated in Fig. 1, is similar in construction to the belt-driven coil-spring grinder previously described on page 151, Vol. 60 of the *American Machinist*.

The work-feeding apparatus consists of a V-shaped trough that is mounted in a horizontal position to the left of the fixture and close to the grinding wheels. The work in the trough is fed to the fixture by means of a sliding member. This is operated through an opening-and-closing device that is actuated from a cable and weight. As each ring is fed into the machine, the left-hand spindle is slightly withdrawn from its working position. This is accomplished by means of a cam drive shaft that operates a connecting rod. The rod is attached to a crank lever which operates directly on the sliding machine spindle. An adjustment is provided so that this movement can be controlled to suit the requirements of the work.

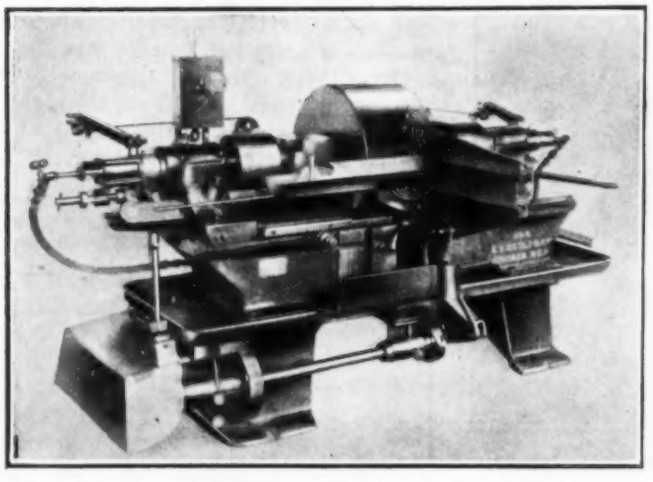
As soon as the ring is fed forward about three-fourths of its diameter, the cam releases the spindle and it moves forward to grind the work. This movement is controlled by means of a weight feed. The adjustment of both spindles for sizing the work is controlled by means of micrometer screws at each end of the machine

The automatic work-feeding fixture is attached to a T-slotted pad on the front of the base of the machine, and also is secured to a pad on the water hood at the rear of the machine. The slide that carries the feeding ram is mounted in a guide casting and is held in place by means of adjustable gibs. The top gib holding the slide in suspension acts also as a side bearing. The feeding rams are attached to the inner end of the slide and vary in width and in thickness in accordance with the rings to be ground. It is claimed that this method of mounting keeps the wearing parts out of the grit and slush.

The various sizes of work-supporting bars are attached to the guide casting at the front of the machine and, extending through between the grinding wheels, are attached at the other end to an adjustable pad on the water hood. An adjustable floating guide bar is provided to hold the work from being forced upward and it is mounted directly over the work-supporting bar.

The fixture drive is a unit in itself and consists of a ½-hp. motor that operates through a reduction spur gearing. The drive then passes through cone pulleys and a belt, a drive shaft, an adjustable crank disk, a connecting rod and lever and the link to the feeding slide on the fixture. When desired, the fixture can be driven by belt direct from the countershaft.

In Fig. 2 is shown a rear view of the machine and the chute for conveying the finished rings away as they come from between the wheels.



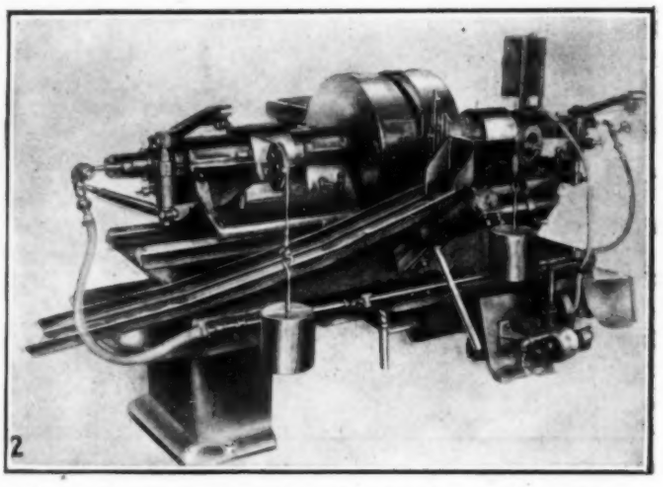


Fig. 1—Besly Automatic Piston-Ring Grinding Machine. Fig. 2—A rear view showing the work chute

The grinding wheels are 20 in. in diameter and are of the standard disk type used by this company. The wheels are set up with steel disks and secured with a waterproof cement. The disk wheels are fastened to heavy cast-iron backing plates that are rigidly attached to wheel dollars on the spindles.

The wheel-dressing attachment can be seen in Fig. 2 at the rear of the base of the machine. It has a wide cutter bar in which two sets of dressing cutters are mounted. The cutter bar is secured to a rocker box on a horizontal shaft. The shaft has a traverse movement parallel with the ways on the machine bed, which is operated from a screw feed at the left-hand end of the machine.

The grinding coolant is held in a three-compartment settling tank at the rear of the machine, but is not shown in Fig. 2. The coolant is carried through piping from the pump to the outer end of each spindle. It is then conveyed directly through the center of the spindle to the disks, where it can spread over the disk faces as they are revolving.

SHOP EQUIPMENT NEWS

Ames Cabinet-Type Precision Bench Lathe, No. 3

The cabinet-type No. 3 precision bench lathe illustrated has been added to the line of similar equipment manufactured by the B. C. Ames Co., Waltham, Mass. The machine has a gear drive and electric motor and is intended for regular production, for the experimental laboratory, or for the home workshop.

The cabinet is constructed of finished oak and is equipped with four

Ames Cabinet-Type Precision Bench Lathe, No. 3

large drawers in which lathe attachments can be kept. It is 48 in. long and 25 in. wide. The height of the table is 36 in. and the total height is 76 in. The table surface is covered with heavy linoleum and at the left front corner of the cabinet is the switch for the motor of the lathe.

The No. 3 bench lathe provided is designed for precision turning, milling, grinding, drilling and thread cutting. The headstock is made for ⅝- and 1-in. spring chucks. The headstock spindle swings work up to 8¾ in. in diam. over the bed of the machine which is 36 in. long.

The lathe is driven from a ¼- or ⅓-hp. electric motor that is mounted below the lathe in a compartment. The motor can be operated from the ordinary lighting circuit. A belt for the drive extends through the top of the cabinet to the gear set.

The gear drive supplied with the equipment eliminates the countershaft and jackshaft. It consists of gears and friction clutches that are operated from treadles. The three sets of helical gears, used for the three speeds, run constantly in mesh and in a bath of oil. They are mounted on ground steel shafts that rotate in ball bearings. Two speeds forward of 720 and 150 r.p.m. and a reverse at 150 r.p.m. are available.

Monitor Hoist Controller and Master Station

The Monitor Controller Co., Baltimore, Md., has developed the hoist-controller illustrated in Fig. 1 and the rope-operated master station shown in Fig. 2. The equipment is intended for traveling cranes, chain and rope hoists or similar applications. The controller, which is re-

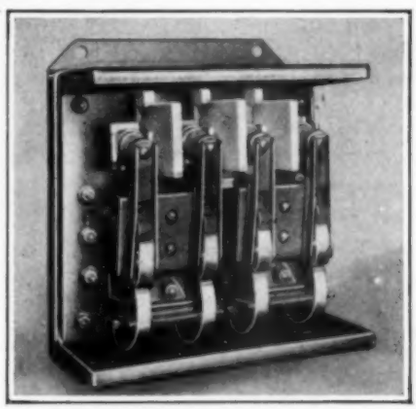


Fig. 1—Monitor Hoist Controller

versing, is for use in connection with d.c. or polyphase a.c. motors that are thrown across the line for starting.

The controller consists, essentially of inclosed-type, two-double-pole, mechanically-interlocked contactors that have blowout magnets and suitable barriers, and graphite-to-copper contacts.

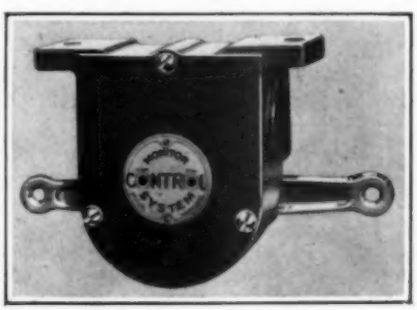


Fig. 2—The control master

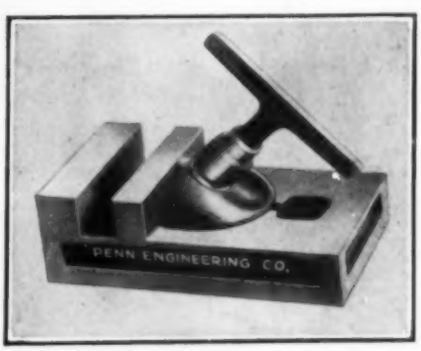
The control master is of the fully-inclosed type and is intended for operation from ropes. It is self-centering and is always in the off position except when held forcibly in either the forward or the reverse position, by the operator. The pull of the operating ropes is taken by bosses cast on the station housing to protect the contacts from damage.

The dimensions of the controller are 8½x10½x6 in. and the master station is 3½ in. high and 3 in. deep.

Penn Quick-Adjusting Vise

The Penn Engineering Co., North 3rd Street, Reading, Pa., is manufacturing the quick-adjusting vise, illustrated, for general application on machines.

The movable jaw operates in a slot lengthwise in the base. Along the inside of the top of the base are lugs spaced equidistant from each other. In clamping the vise, the movable jaw is set to position and the handle, which can be seen in the illustration, is tightened. The turning of the handle draws a bolt with a hook at



Penn Quick-Adjusting Vise

the lower end against the lugs. The tightening of this bolt at the same time pulls the jaw down toward the base of the vise.

The movable jaw can be swiveled so that it is possible to clamp tapered pieces in the vise. Three sizes have been placed on the market, having jaws 3½, 5½ and 8 in. The weights are 16, 31 and 56 lb., respectively.

SHOP EQUIPMENT NEWS

Chicago Pipethread Machinery Co. Pipe-Threading Machine

The pipe-threading machine illustrated in Fig. 1 is being manufactured by the Chicago Pipethread Machinery Co., 1615 Racine St., Racine, Wis. for portable and production purposes. The capacity of the machine is from ¼ to 2 in. It can also thread bolts from ½ to 1½ in. in diameter and drive hand stocks. With the addition of a universal drive shaft it will handle up to 12-in. pipe. Fig. 2 is an end view of the machine and shows the cut-off attachment.

The machine is motor-driven through gears and the motor is protected from oil and chips. Any lighting circuit can be used as a source of power. Three speeds are provided through lever-controlled sliding gears. The gears are machine cut. The shafts run in large bearings that are replaceable. The spindle is of heavy construction and its bearings are also replaceable. On each end of the spindle are mounted chucks, the front one being equipped with pipe-holding jaws. The rear chuck serves only as a centering device for holding long lengths of pipe. Gripping chucks can be applied to both ends if desired.

The die-head has a quick-opening device. In the handle is contained the micrometer adustment for producing under or oversize threads. The die slots can be replaced when they are worn, in order to prolong the useful life of the machine. The face-plate can be easily removed in order to clean the inside of the die-head and for changing dies. The supports of the die-head are nearly central and are located on ways in a similar position. This is said to prevent oil splash.

At the rear of the die-head is located the cut-off attachment, which is of a heavy construction. All sliding parts are accurately machined and gibbed. The reaming tool is mounted on the cut-off block and is actuated by turning the handle toward the center of the machine after the cut. This is accomplished without changing the location of the die-head. The centering V-block is located in a position that is said to prevent the pipe from rolling up over the cut-off knife.

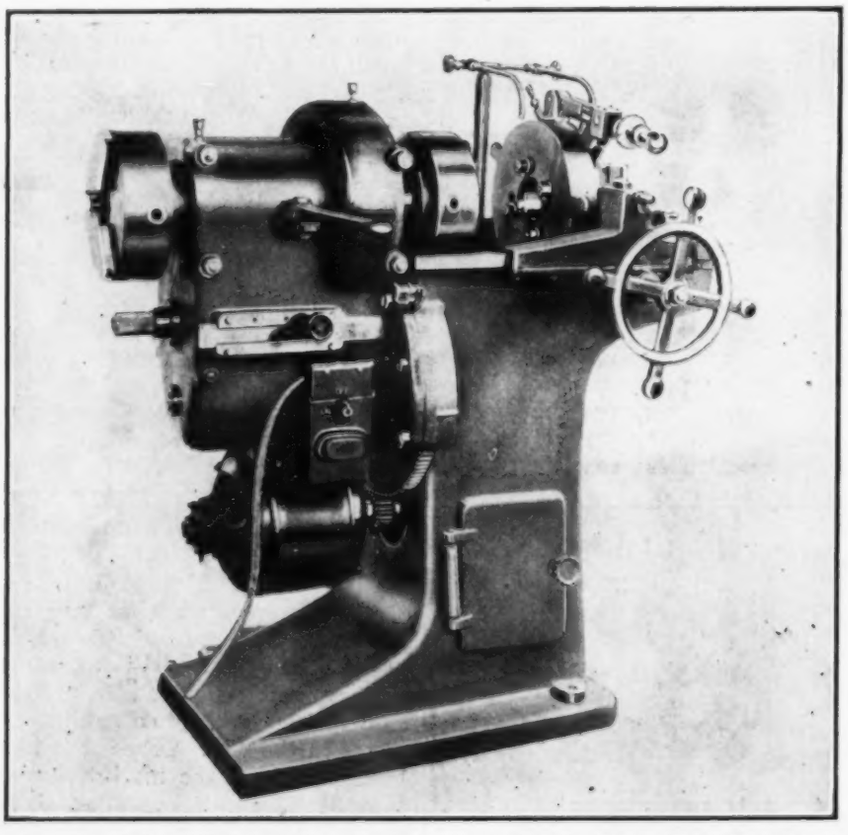


Fig. 1—Chicago Pipethread Machinery Co. Pipe-Threading Machine

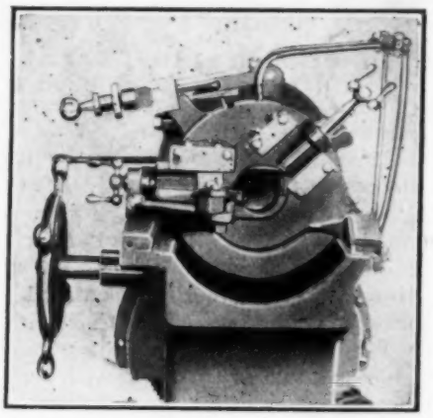


Fig. 2—End view of the machine showing the pipe cutter

The machine is mounted on a pedestal base in which the oil reservoir is located. The oil pump is of the centrifugal type, running at 1,800 r.p.m. and is located at the lowest level of the reservoir for the cutting oil. It is, therefore, always primed. The speed-change gears run in a bath of oil.

The pedestal base houses a tool and wrench cabinet for the dies and wrenches.

Sykes Gear-Tooth Comparator

The Sykes gear-tooth comparator is being introduced in this country by the Farrel Foundry & Machine Co., Inc., Buffalo, N. Y. This instrument has been made and marketed in England but the company now has prepared a complete set of jigs and fixtures and has obtained the necessary measuring apparatus for manufacturing this instrument as well as the gage blocks used in connection with it.

It is intended for comparing the thickness of a gear tooth with a standard involute rack tooth of a given pressure angle, for testing the variation in thickness along the length of any tooth and for comparing the thickness of any tooth in a gear with the other teeth.

It can be used for these purposes on spur, spiral, helical or worm gears. It can also be used as a com-

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parator for bevel gears and, with modifications, for measuring bevel gear teeth.

The instrument is furnished as illustrated in a box that also contains a set of standard gage blocks representing involute rack teeth, to which the inclined faces of the comparator jaws are made to correspond.

For use as a comparator, the jaws are set to the proper gage block so the indicator reads zero. It is then applied to the teeth of the gear to be tested and the variation in thickness will show on the indicator plus or minus, depending on the height to which the tooth rises between the jaws. For testing uniformity or for making comparison between teeth,

Sykes Gear-Tooth Comparator

the gage blocks are not necessary. Also, if desired, a master gear can be substituted for the blocks.

The jaws of the instrument are made glass hard and are ground and lapped. The gage blocks are made of crucible steel and are also hardened, ground and lapped to a high degree of accuracy. They are guaranteed to be within 0.003 inches.

As a standard, the jaws and blocks are laid out for a 14½-deg. pressure angle, but the set can be supplied to other angles when so specified. Each division of the dial with the standard angle represents 0.0005 inches.

The instrument has a capacity for measuring teeth of 12 diametral pitch to 1 diametral pitch and from ¼ to 3 in. circular pitch. A set of instructions for its use on all conditions, and with special as well as standard teeth, is furnished.

Hammond Radial Nut-Setting and Stud-Driving Machine

The Hammond radial nut-setting and stud-driving machine has been placed on the market by the Hammond Manufacturing Co., Cleveland, Ohio. It is intended for work on automobile engines and similar assemblies.

The design is similar to that of the radial drilling and tapping machine built by the company and permits the operator to move the spindle from one position to the next with a straight-line motion. The arms swing on radial ball bearings.

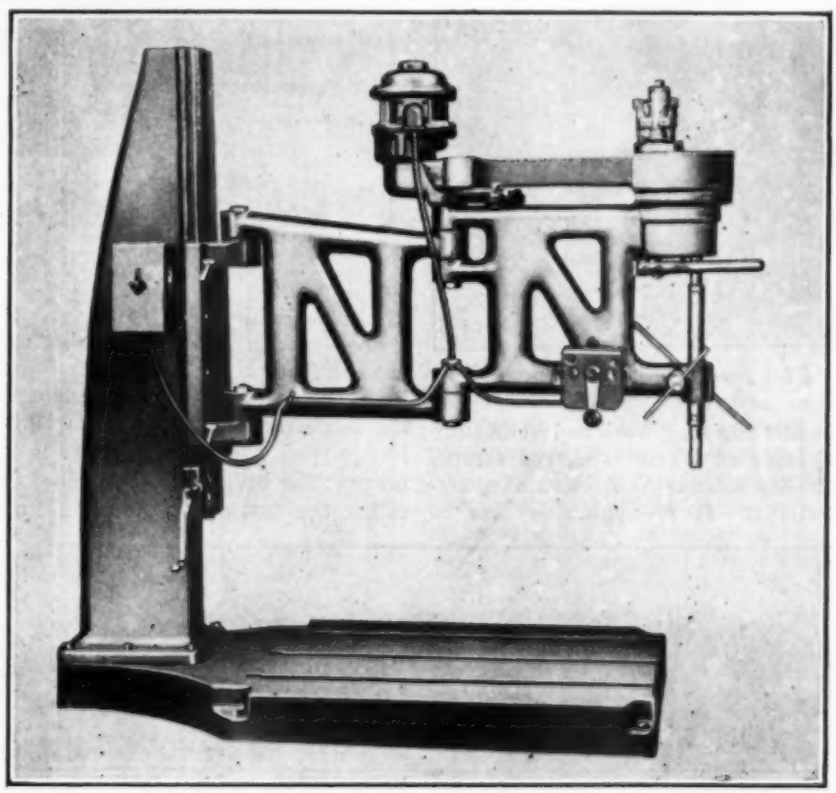
A General Electric vertical-type ball-bearing motor is mounted on the outer arm and is belted to the spindle driving pulley. A ball bearing idler is located to assist in maintaining correct belt tension. Between the spindle pulley and the spindle there is a gear reduction of 2½ to 1 to provide power and speed suitable for driving ⅝-in. studs, or for setting nuts of the same size.

Mounted in the spindle-pulley assembly, is a clutch that is arranged to be operated by means of a lever projecting horizontally toward the front of the arm. The clutch itself is of toothed design with the teeth inclined so the drive will stop when a certain amount of resistance is met. The amount of this limiting resistance can be adjusted by turning a nut on the end of the clutch assembly to alter the pressure exerted to hold the teeth in engagement.

The motor, which is included as standard equipment, operates at 1,800 r.p.m. from a 3-phase, 60-cycle circuit. An inclosed starting switch and a drum-type reversing switch are also furnished when required to reverse the spindle.

The machine can be furnished in either the column type, as illustrated, or in a wall or post type that differs from the former principally in the elimination of the base and in the design of the wall attaching member on which the radial arms are supported.

A box-type work table with a top working surface measuring 30 in. in length by 20 in. in width and having



Hammond Radial Nut-Setting and Stud-Driving Machine

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three T-slots can be supplied as an extra.

The maximum distance from the spindle to the face of the column is 4 ft. 3 in., the minimum distance from the spindle to the column is 18 in. The saddle has a vertical adjustment of 24 in. on the column. The spindle traverse measures 8 in. There is a No. 4 Morse taper provided for fitting the tool. The speed is 260 revolutions per minute on the standard drive.

The column type with a T-slotted base weighs 2,500 lb., the post type with a pedestal base, 2,100 lb., the wall type, 950 lbs., and the work table just mentioned 500 pounds.

Sheldon Locomotive Frame-Jaw Grinder

Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York, N. Y., has added to its line of tools the Sheldon locomotive frame-jaw grinder illustrated. The grinder has been developed as a portable tool to replace manual labor and to reduce file costs on such work as leveling the surfaces of frame jaws, rod straps, and for similar locomotive shop operations. It is applicable also to work in other industries where flat surfaces require leveling.

Fig. 2—Grinding a frame jaw

The grinder is simple in design, compact and balanced for easy operation. It is air operated through a pneumatic turbine-type motor driving a rotor shaft that serves as the wheel mounting.

The body of the grinder is made of a one-piece 3-in. tubing, 15 in. in length, thus insuring proper alignment of the rotary parts. The tubing covers one side of the grinding wheel to protect the operator. The motor is mounted on radial ball bearings lubricated by the Alemite system.

The abrasive wheel used is 2½ in. in diameter, 6 in. in length, equipped with a ¾-in. hole. The view in Fig. 2 shows the application of the tool for grinding a locomotive frame jaw. The weight of the grinder is 16 pounds.

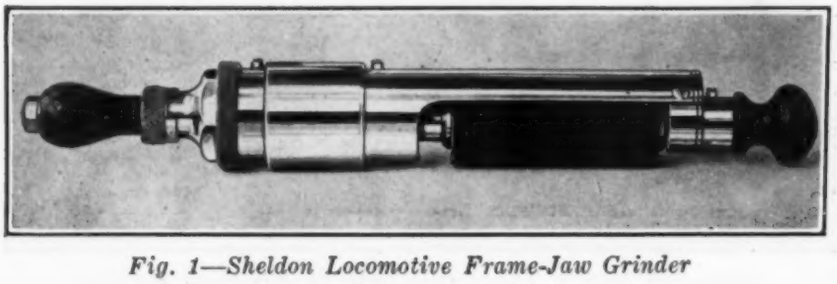


Fig. 1—Sheldon Locomotive Frame-Jaw Grinder

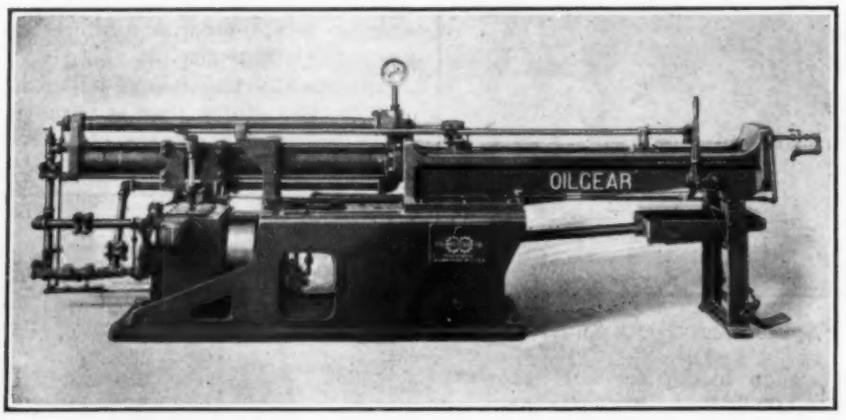
Oilgear Broaching Machine, No.-3

The Oilgear Co., 657 Park St., Milwaukee, Wis., has placed on the market the No.-3 broaching machine, illustrated. This model is heavier in construction than the similar machine previously described on page 390, Vol. 57 of the *American Machinist*, and has been improved.

The base of the machine has been made considerably heavier than that of the original model, as has the U-shaped trough in which the sliding head operates. A pedal control has been provided to allow the operator the use of both hands. The machine is equipped with a safety device to prevent the breaking of broaches on either the cutting or on the return stroke. The control is so arranged that the ram can be stopped or reversed at any point of its stroke so that the work can be examined.

A direct-reading pressure gage shows the amount of pull, in pounds, to which the broaching tool is subjected. The maximum pulling capacity is 25,700 lb. The speed of both the broaching and the return stroke can be varied from 48 to 360 in. per min., the rates of speed being independent on the two strokes.

Any constant-speed source of power can be used to drive the machine, since no shifting of belts or gears is required.



Oilgear Broaching Machine, No. 3

Grobet Swiss Files

The Grobet File Corporation of America, 64 Reade Street, New York, N. Y., has put the Grobet swiss file on the market in this country.

The principal feature of the file is in its staggered teeth, which are similar to those produced when the file is cut by hand. The material used is hard, crucible steel.

SHOP EQUIPMENT NEWS

Badger Cylinder-Wheel Grinding Machine No. 221; Special Adaptation

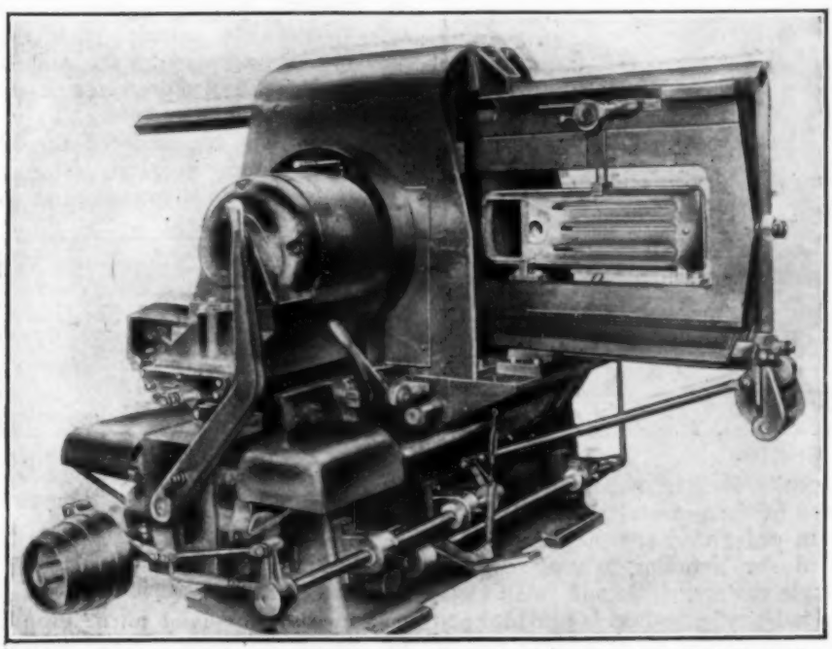
The Badger Tool Co., Beloit, Wis., has adapted its regular No. 221 cylinder-wheel grinding machine for grinding the two parallel sides of section castings of steam radiators, as illustrated. The castings on which the work is performed are 26 in. long, 9 in. wide and 2 in. thick. The machine is used to grind ribs at the lower end of the casting on each side. The ribs measure approximately 9 in. square and ¼ in. in width. At the end opposite to each is a raised spacer boss ¾ in. in diameter. The parts are finished so that the joints between the sections will be tight.

The casting is placed in a frame-like fixture and is supported on two hardened V-blocks and located at the top by means of a quick-acting clamp. The entire fixture slides on V-ways at both the top and the bottom, and passes through the machine and out at the back. The fixture or carriage is operated by power through a rack and pinions connected to the reduction gear box which is driven from the motor and which furnishes four traverse speeds. The traverse is set in operation by means of a clutch the lever for which can be seen at the near end of the machine. The carriage is provided with an automatic stop.

Two men can operate the machine, one loading and starting the traverse and the other unloading the castings. In case the machine is operated by only one man, it is reversed when the piece is part way through and the piece is brought back to the starting point where it can be unloaded.

The grinding machine is of the two-spindle type to simultaneously grind both sides of the casting and has two built-in, motor-driven heads each of which carries an 18-in. cylinder-wheel chuck and abrasive cylinder. The grinding heads are opened by means of a treadle before the work enters, after which the pressure is removed and the grinding heads close in to the micrometer stops. Wheel dressers are mounted on each end of the work fixture. The grinding is done dry.

Two 7½-hp. motors are used and fitted with a Badger end yoke construction. The spindles are mounted in both radial and thrust ball bearings. The grinding heads are provided with adjustment in all directions so that the wheels can be set accurately parallel and in alignment with the cross-travel of the carriage. The equipment weights 6,200 lb. and requires an operating floor space of 9x10 feet.

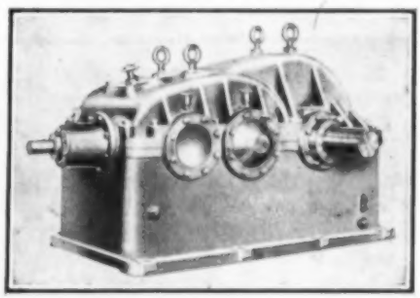


Badger Cylinder-Wheel Grinding Machine, No.-221, Special Adaptation

Philadelphia Compound Spiral-Bevel and Herringbone Gear Reducers

The Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa., has developed a line of compound spiral-bevel and herringbone gear reducers. The model illustrated is for triple reduction, but the line also includes single- and double-stage reducers.

The units are intended for service where unusual high speeds are necessary, but where it is impractical to use a water-cooling system to keep down the temperature of the set.



Philadelphia Compound Spiral-Bevel and Herringbone Gear Reducers

The high-speed shaft turns in a single- and a double-row ball thrust bearing. On the end of this shaft is a spiral-bevel pinion which engages in the spiral bevel gear. This gear and the herringbone pinion are mounted on the same shaft. For each additional reduction a set of herringbone gears and pinions are used.

Oil-splash lubrication has been adopted and the casing has three oil plugs, one for filling, one for the oil level and one for draining purposes. The upper half of the casing can be removed and the set inspected without disturbing the mounting of the gears and the bearings.

Heat-treated nickel steel is used for the blanks from which the gears are generated. Double-stage units can be furnished up to 200 hp. and with reductions up to 36 to 1, while a ratio of 200 to 1 can be obtained from the triple-stage reducer.

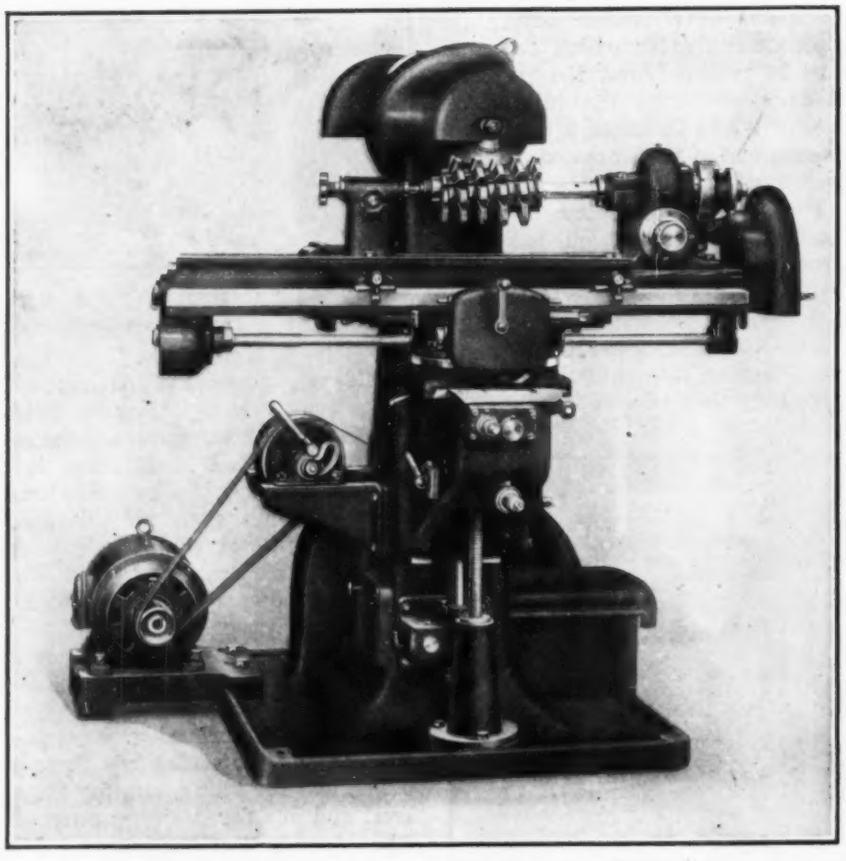
SHOP EQUIPMENT NEWS

"Pfauter" Hob-Sharpening Machine Model-FSS

The O. Zernickow Co., 15 Park Row, New York, N. Y., has introduced the Pfauter hob-sharpening machine in this country. The model-FSS is illustrated. The machine can be used to sharpen any spiral-fluted hob from the smallest up to the rated capacity of a given model, and to handle reamers, cutters, taps and similar cutting tools having straight or spiral flutes. In addition, and by means of a special fixture, face mills measuring up to 13¾ in. in diameter can be sharpened.

The operations are semi-automatic, the table having full-automatic longitudinal feed, while the setting of the work to the grinding wheel and the indexing from one flute to another is accomplished by hand. The work is rotated simultaneously with the movements of the table to follow the contour of the flutes by setting a change-gear arrangement located at the index head. A full set of gears is furnished. Their arrangement is facilitated by the use of a table which shows the effect of using various combinations. All of the gearing in service is suitably guarded. The arrangement of feed and grinding is such that actual work is performed on both forward and reverse movement of the table. There is also a range of table movement that allows it to be swiveled in both directions to 45 deg. from its normal position.

The machine is equipped with a vacuum dust remover which exhausts the dust from the grinding zone and deposits it in a water tank at the base of the pedestal.



"Pfauter" Hob-Sharpening Machine, Model-FSS

In order that the machine can be used for grinding milling cutters, single cutters, drills and small tools, an independent wheel is provided and is accompanied by a suitable rest at one end of the grinder head back of the table.

The grinding spindle is hardened and ground to run in adjustable, dust-proof bearings of phosphor bronze. On the end carrying the hand cutter wheel, there is provision for using interchangeable wheel arbors with taper shafts to fit the spindle. A truing device is furnished for holding and guiding the truing diamond. It can be set to the desired angle. The device, however, does not include the diamond as part of the regular equipment.

The machines have single-pulley drive for attachment through a belt to any source of power, or to a motor as shown in the illustration.

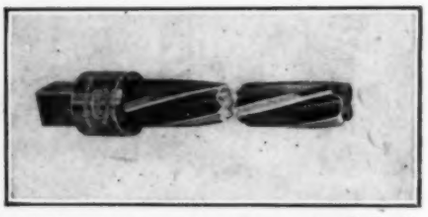
The longitudinal movement of the table is 17¾ in., the vertical movement 9 in. and the cross adjustment 6 in. The maximum center distance on the table is 25⅝ in., with a capacity to swing work that measures 12½ in. in diameter. The maximum grinding wheel diameter is 7⅛ inches.

The speed of the driving pulley is 800 r.p.m. A 3-hp. motor is recommended. The net weight of the machine is 2,270 lb., the floor space required is 67x71 inches.

"Celfor" Locomotive Frame and Rod Reamers

The Clark Equipment Co., Buchanan, Mich., has redesigned its line of "Celfor" locomotive frame and rod reamers to comply with the specifications adopted by the American Railway Tool Foremen's Association in September, 1925.

The reamers are made of forged high-speed steel in sizes ranging from 1 to 2 in. in diameter in steps of $\frac{1}{32}$ in. The lengths are furnished from 8 to 26 in. and the taper is $\frac{1}{8}$ in. to the foot. The flutes are made with a left-hand spiral, ground to insure accuracy. The cutting edges are ground with a double relief.



Celfor Locomotive Frame and Rod Reamers

SHOP EQUIPMENT NEWS

Sykes Gear-Lapping and Testing Machine

The gear-lapping and testing machine illustrated is built by the Farrel Foundry & Machine Co., Inc., Buffalo, N. Y. It is intended for use in connection with the Sykes gear generators, also being built by the company, for testing the gears after they have been cut.

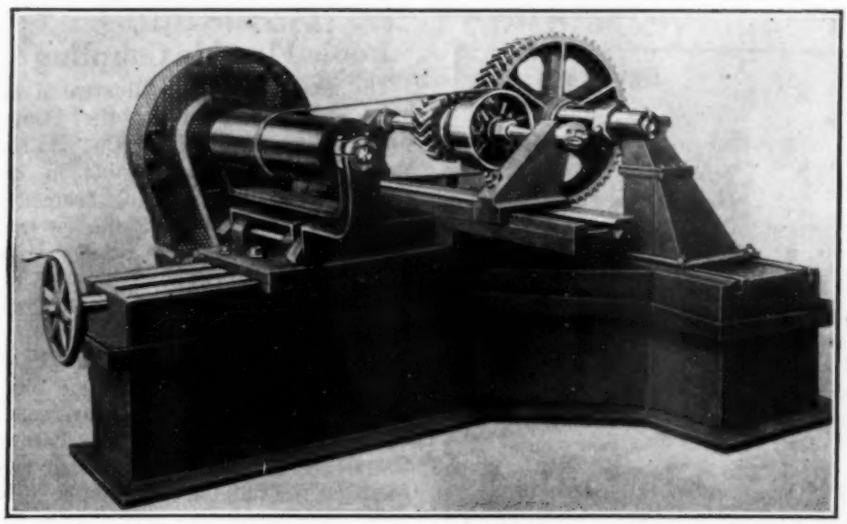


Fig. 1—Sykes Gear-Lapping and Testing Machine

The gears are mounted on arbors and are set to run in a pair of pedestal bearings on the bed of the machine. One of these pedestals is adjustable in T-slots cut in the bed, as shown in Fig. 1, to accommodate varying widths of gears. The other is bolted to the bed in a stationary position. Two other pedestal bearings for the pinions to be tested are mounted so that both are adjustable along ways on a carriage, which in turn can be moved on the main bed by means of a handwheel and lead screw. The second pair of bearings can be arranged to carry an arbor, or to carry the pinion, when it is integral with the shaft, upon centers.

A split steel pulley is secured on the pinion arbor and serves to rotate the pair of gears by belt connection to a driving drum which is pivoted on the rear end of the carriage. A motor set on the floor drives this drum.

The gears to be tested are thoroughly cleaned, are then placed in the machine and rotation is started. Defects that may cause noise are at once discernible along with other characteristics of the teeth. Lapping compound may be introduced if necessary between the teeth, and the action watched until the results desired are obtained.

A scale, with vernier attachment, is fitted for measuring the distances between centers.

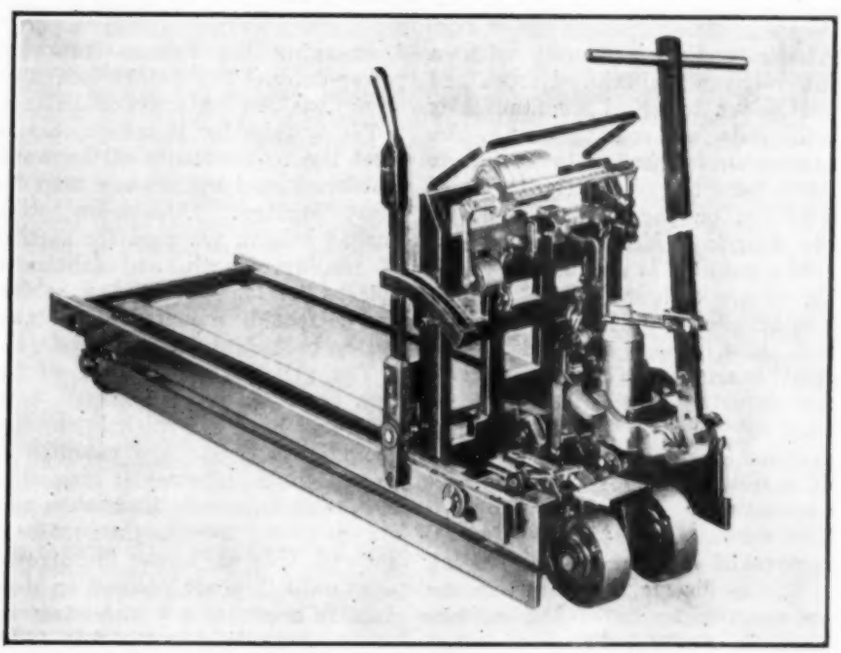
The machine illustrated is made in batches and is carried in stock. It will handle gears up to 48 in. in diameter, while width is not a limiting factor. Other machines can be built by the company, to specifications, for covering a larger or smaller range.

National Scale-Elevating Truck, "N"-Series

The "N"-series combination lift truck and weighing scale has been brought out by the National Scale Corporation, Chicopee Falls, Mass. This model represents an improvement over the scale-truck previously described on page 569, Vol. 43, of the *American Machinist*.

The design of the truck itself follows that of the regular lift trucks manufactured by the company, the scale being a complete unit in itself. The scale is of the beam type and is provided with weights and poises. When the truck is run under a lift platform and elevated, the load can be weighed. Tare weight is also set off as in a regular scale. The lever shown at the left of the head of the scale can be drawn forward, raising the side bars to take the load off the scale platform to protect the scale when material is transported.

The capacities of the eight sizes in the line range from 2,000 to 3,500 lb. The sizes vary from 18½x 63½ to 25½x72½ in. Their weights are from 400 to 1,000 pounds.

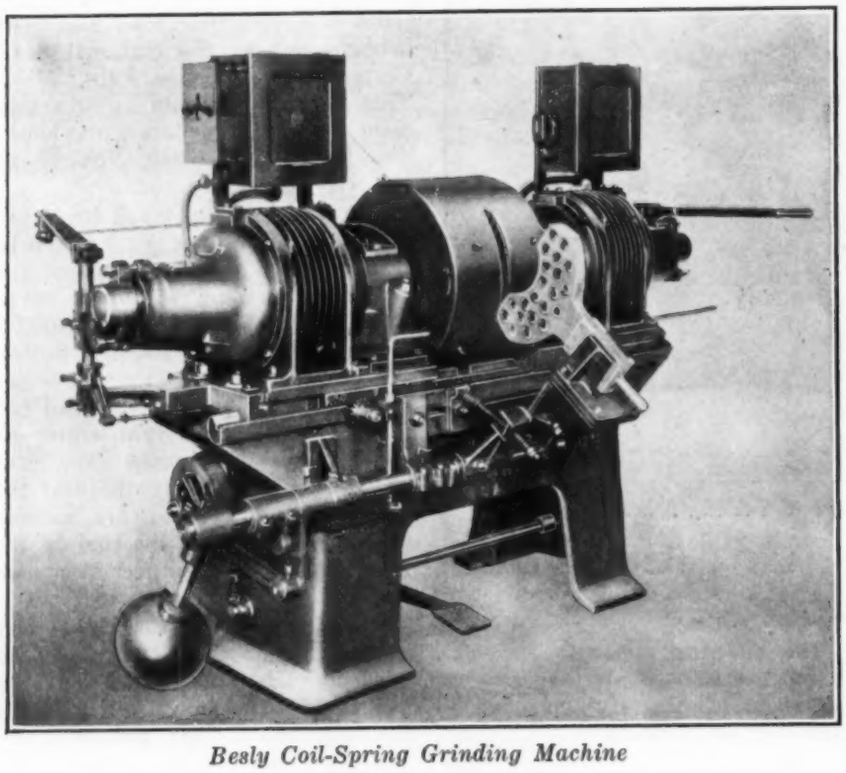


National Scale-Elevating Truck, "N"-Series

SHOP EQUIPMENT NEWS

Besly Coil-Spring Grinding Machine

The oscillating-type coil-spring grinding machine, illustrated, is manufactured by Charles H. Besly & Co., 119 North Clinton St., Chicago, Ill. The machine is an adaptation of the standard No. 6-18-I dry, direct-motor-driven, ring-wheel grinder and is equipped with a power-driven oscillating fixture and workholder to grind simultaneously both ends of coil springs. The adaptation is similar in design to that for the belt-driven model described on page 151, Vol. 60, of the *American Machinist*.



Besly Coil-Spring Grinding Machine

The machine is driven by two 7½-hp. motors with special end casings. The spindles are 2½ in. in diameter and have phosphor-bronze, ring-oiled bearings. The motor heads are adjustable and constructed to slide on V-ways. The sliding spindles are operated outward by means of a treadle and close on the work automatically from a weight feed. The exhaust hood provides for the removal of dust during the grinding.

The oscillating fixture is mounted on the front side of the machine base. It is operated from a connecting rod attached to a motor-driven reduction-gear unit that is mounted at the rear of the base of the machine. A T-slotted crank disk is attached to the reduction-gear unit. The oscillating motion can be adjusted to meet the requirements of the work to be ground. A locking device is provided for engaging and disengaging the fixture from the power drive. The fixture has, also, an adjustable counterweight balance.

The workholder is constructed to meet the requirements of the work. Hardened steel holders are used for short springs. Aluminum steel-bushed holders are used for springs of medium length, and fabricated holders for long ones. The holders are detachably mounted in a socket on the oscillating fixture.

The grinding wheels are of the ring type, 18 in. in diameter, 4 in. deep and have a 9-in. hole through them. The rings are mounted in pressed-steel adjustable ring-wheel chucks and protrude 1 in. when new. As they wear down to the surface of the rim, they can be set in narrower ones until they are reduced to about ¾ in. in thickness. A wheel-dressing device is provided at the rear of the machine. The exhaust hood has a removable leaf to allow the entrance of the cutter bar between the wheels.

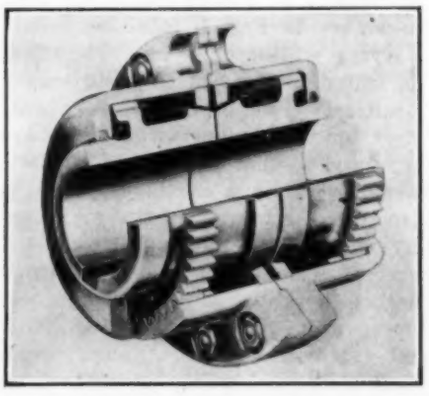
The coil springs shown in the fixture illustrated are 1⅞ in. in diameter, 1¼ in. long and made from ⅛-in. wire. Twenty of them can be mounted at one setting of the fixture. In operating the machine, two holders are generally used.

Poole Flexible Coupling

The flexible coupling illustrated is being manufactured by the Poole Engineering & Machine Co., Baltimore, Md. It is obtainable in 15 sizes for shafts measuring from 1½ in. on the smallest, to 12 in. on the largest in the line. The rated transmission capacity ranges from 10.5 to 5,350 hp., figured at 100 revolutions per minute.

There are six parts, two hubs having external gear teeth at one end, two sleeves with internal gear teeth, and two aligning rings which fit into the sleeves. The outer faces of the teeth on the hubs are formed spherically to provide true self alignment. This allows the sleeves, which are bolted together, to assume a neutral position when the driving and driven shafts are out of alignment.

Each hub of the coupling has a tapered surface at its inner end, which matches a corresponding taper on the retaining ring. This keeps the parts in position and assists in alignment when the two half assemblies are apart from each other. All parts are made of high-carbon, forged steel.



Poole Flexible Coupling

The coupling ratings that have been given are based on an even torque and rotation, as named, at 100 revolutions per minutes. There will, of course, be variations in these ratings under different conditions.

News of the Week

Germany Fast Developing an Efficient Commercial Air Transport System

Treaty terms have aided materially

The progress made in aerial transportation in Germany during the past few years is undoubtedly one of the outstanding accomplishments in the field of aviation, says Lee C. Morse, special agent of the transportation division, Department of Commerce. Immediately following the war, numerous small independent air transport services were formed and operated over various routes on more or less regular schedules. It was not until May 5, 1922, however, that commercial air transportation in Germany made any real progress. On that date Germany was authorized to resume, under certain restrictions and control by the Allies, the production of commercial types of planes.

Under the terms of the Treaty of Versailles, Germany was forbidden to maintain any military or naval air forces. The treaty limited the size of airplanes and the horsepower of engines which could be employed or manufactured. Whether these restrictions have been a help or a handicap in the development of commercial air transportation services can be better judged after considering their effect upon the aircraft industry from the industrial or manufacturing point of view.

The fact that Germany has been forbidden to maintain military and naval air services has eliminated the government as a buying factor. Similarly, the limitations on the size of planes and the power of engines which can be manufactured, has kept the industry from seeking orders for war planes from foreign countries. Producers of aircraft have been compelled to confine their efforts to building up a market for their product entirely within the commercial transport field. The development of aircraft for military and commercial uses in other countries has progressed in recent years along lines that make it apparent that the use of war planes for commercial purposes is decidedly uneconomical.

The German manufacturers and designers contend that as long as they are restricted to small-power plants they can not build commercially efficient types of planes. It is undoubtedly due to this fact that German designers and builders of aircraft have not of late produced any important new types of commercial transport airplanes. It is true, however, that the concentration of the entire industry on the designing of aircraft for commercial use only, has resulted in the production of a type of plane which in the light of actual performance may be considered among the safest, most economical, and efficient now in use.

It is in the operating field rather than the technical that the greatest progress has been made. At the present time, there are two air transportation companies in Germany—the Deutscher Aero Lloyd Aktien Gesellschaft and the Junker Luftverkehr. The growth of these two companies has been so remarkable that they now form two powerful groups of air services which have almost succeeded in dominating the principal air routes of northern, eastern and central Europe.

The Deutscher Aero Lloyd came into being in February, 1923, as a result of the amalgamation of a majority of the existing smaller independent companies. This company lists among its stockholders many of the leading shipping companies, business houses, and banks of Germany.

It is the intention of the Junkers Co. to combine all the companies with which it is now associated into an organization to be known as the "Europe Union," with which would be merged the existing "Trans-Europa" and the "Nord Europa" unions. In the new combination the main object of the Junkers Co. is the standardization of planes of Junker construction and the establishment of a uniform system of maintenance and repair. In other words, the Junkers Co. would take care of all matters of a technical nature and the local companies would be responsible for the sale of tickets, handling of freight and mail, and all phases of commercial management.

Trade Commission Failed in Judicial Purpose

Failure of the Federal Trade Commission to develop along judicial lines, as have other similar bodies of specialists, such as the Interstate Commerce Commission and the admiralty courts, is regarded as mainly responsible for the demand of its abolition. That there is a great need for a quasi-judicial body to deal with matters of unfair practice is admitted, but it will have to establish its principles out of precedent and experience. The instinct of the people is against an institution in which the judges do the charging.

The examiners and attorneys of the Interstate Commerce Commission, for instance, come before the Commission in much the same way as the representatives of the Attorney General go before the Supreme Court. They are in the same category as the representatives of the other party to the case and decisions frequently go against them.

There is evidence that the attempt of the Federal Trade Commission to fly in the face of the experience of a thousand years is unsuccessful, as its record shows that it has been wrong about seventy-five per cent of the time and has set up no fundamental principles which can be followed.

Aero Safety Code Ready for Distribution

The American Aeronautical Safety Code is now available. It is published and distributed by the Society of Automotive Engineers, Inc., 29 West 39th St., New York. The price for single copies or small quantities is $1.50 each; for larger quantities a reduced price will be quoted. Orders should be addressed to the Society of Automotive Engineers.

The American Aeronautical Safety Code is one of a series of safety codes formulated under the rules of procedure of the American Engineering Standards Committee. In 1920, the Society of Automotive Engineers and the Bureau of Standards were designated joint sponsors for the code and in 1921 the sectional committee for the Aeronautical Safety Code was formed, broadly representative of all important aeronautical interests.

In drafting the code the intention was not to prescribe too closely the acceptable methods of design, construction or operation, but to formulate criteria of good practice that would promote a general agreement and understanding as to acceptable safety standard. The code includes the following parts: Introductory Part; Part 1, Airplane Structure, Design, Fabrication and Tests; Part 2, Powerplants, Design, Assembly and Tests; Part 3, Equipment, Maintenance and Operation of Airplanes; Part 4, Signals and Signalling Equipment; Part 5, Airdromes and Airways; Part 6, Traffic and Pilotage Rules; Part 7, Qualifications for Airmen; Part 8, Balloons (Free and Captive); Part 9, Airships; Part 10, Parachutes.

The code was completed in the spring of 1925. It has been approved by the sectional committee which formulated it and by the two sponsors. On Dec 7, 1925, it was approved as a tentative standard by the American Engineering Standards Committee.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

ON Christmas Eve American business stopped

"To rest beside the road a while
and hear the angels sing."

Normal activity will not be resumed until the 4th of January, and the indications are that with the resumption we shall see further expansion in the volume as well as the activity of trade. The retail sales during December have probably been the largest on record, and the small stocks left will need replenishment. A confident cheerfulness pervades nearly all departments of trade and everyone expects continued prosperity during 1926.

As a result of the preoccupation with Christmas the speculative markets were somewhat neglected during the early part of last week, and on the Stock Exchange the reactionists found a pretext for attacking the market in the higher rates asked for call money, which touched 6 per cent. But it soon became plain that the higher rates were entirely due to the Christmas demand for currency and the preparations that were being made for the huge interest and dividend payments due on the 1st of January. When this was realized the market turned and the decline was fully recovered in a few hourse of trading.

Cotton showed a similar resiliency and the drop that followed the issuance of a ginning report which is thought to indicate a commercial crop of well over sixteen million bales was more than offset by the advance recorded when it became known that the *Manchester Guardian* had predicted that the world's consumption of cotton during the present season would be the largest in the history of the trade.

The story of the wheat market is much the same. It jumped nearly 9 cents a bushel on a government report indicating a reduction of 28,000,000 bu. in this year's yield, and although a slight reaction followed upon the sensational bulge still higher prices are confidently looked for.

The action of the three markets mentioned attests the bullish sentiment that exists in this country and is gradually spreading throughout the world as the hope of universal and prolonged peace becomes more confident.

It is quite natural that Christmas should increase the fervency of this hope and even the cautious will pray that it may become a reality during the year upon which we are about to enter.

Meantime the sunshine is so brilliant that it is really hard to see the few clouds that are discernible. One of them is the price of anthracite coal, which is said to be selling at one cent a pound in Boston. Fortunately there is enough bituminous fuel available to keep people warm; else there would be great distress.

Another is the dissatisfaction which some of the farmers' organizations are expressing over the measures of relief suggested by President Coolidge in his Chicago speech. A definite policy of price fixing and a reduction of the tariff is demanded. Therefore it seems probable that we shall hear of some radical proposals in Congress as soon as the revenue bills are disposed of.

LOOKING AHEAD

Favorable Factors Here

- Highest real wages in history
- Highest standard of living
- Largest savings bank deposits
- No large inventories
- Further reduction in taxes
- Railroad situation sound
- Research gaining support
- Standardization progresses
- Restricted immigration

Abroad

- Locarno pact
- Improvement in most European countries
- Return to gold standard
- Funding of debts
- Increasing export trade

Unfavorable Factors Here

- Stock market speculation
- Real estate speculation
- Threatened over-production of automobiles
- Coal strike

Abroad

- Unemployment
- Serious situation in France
- Chaos in China
- Disturbing influence of Russia
- Monopolies

Coffee, rubber and potash, and the prices demanded for them are also attracting a good deal of attention as a result of Secretary Hoover's war upon the foreign combinations that have been organized to maintain the value of these three necessities of American life. Opinions differ as to the wisdom and expediency of the policy that the Secretary of Commerce has adopted.

One result already apparent is an accentuation of the prejudice against Uncle Sam that is felt in Latin America and some of the European countries. It is to be hoped that this prejudice can be allayed, for in attempting to maintain the prices of their own products the foreigners are only following an example that has long been set for them by the United States.

In Cuba, from which island I only returned a few days ago, some of the colonos or sugar planters are expressing this feeling of resentment very definitely by refusing to cut the cane that is now maturing. It seems probable that their own needs will compel them to market their crop without further delay, but one result of their procrastination has been a sharp reduction in the stock of raw sugar available to the refiners, and with November-December meltings that are the largest on record any important decline in the price of sugar seems unlikely in the near future.

Meantime the world's consumption is increasing apace and in sugar, as in cotton, it is quite possible that the increase in the production will be more than offset by the growth in demand.

The news from France appears to indicate that further inflation is inevitable, if indeed it is not desired by those who are influential in French business and industry. It is rumored that the French Government is considering the sale of its tobacco monopoly to an American syndicate as a way out of its present financial predicament, but the rumors may be without foundation.

Mussolini is said to be preparing to declare that Italy is an Empire, with the Italian King as emperor, but cables to the New York *World* indicate that the national feeling against Fascism is growing and the belief that its early fall impends is finding a wider acceptance.

But upon the whole, Christendom enters upon the celebration of its greatest festival with an ardent hope of peace to men of good will that augurs well for the future.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Cincinnati

The past week, according to reports from Cincinnati machine tool manufacturers, has been better than the corresponding week of the previous year. There is always a tapering off of business at the end of the year, it is explained, but this year it was less than usual.

While the actual figures have not yet been made available by the annual closing of their books, manufacturers state that the final totals will show that they did considerably more business in 1925 than in 1924. Many are predicting a heavy demand after the first of the year and all agree that the indications are that there will be an upward trend for three or four months at least.

Selling agents report that the demand in the past week has been better than they expected, with more orders booked than in the corresponding period of last year. They state that the sales resistance is gradually becoming less and they look for less pondering and quicker, snappier buying after the first of the year.

During the week the orders and inquiries were evenly spread over the country and were well diversified as to sizes and types of tools desired. The automotive industries bought freely and sent in many inquiries. A few sales of single tools to railroads are reported, as well as the receipt of some new lists of requirements. The greater part of the orders booked during the week called for single tools, for replacement purposes.

Edward A. Muller, vice-president and general manager, the King Machine Tool Co. says: "In my opinion the demand will increase progressively during the next three or four months. The peak will be reached next spring, I think, after which there will be a decline."

Mr. Dermoty, of the Carleton Machine Tool Co., says, "Basing our opinion on inquiries on hand, we feel confident of a good business for the first three months of 1926. We have had a good business in the past year and we expect next year to be better."

A. H. Tuechter, president of the Cincinnati-Bickford Tool Co., says: "I look for an improvement after the first of the year. I am of the opinion that the first six months of 1926 will be good, but I would not care to make a longer forecast than that."

H. C. Pierle, secretary and sales manager of the R. K. LeBlond Machine Tool Co. said: "I look for a slight falling off the early part of January, with business progressively picking up after that. I look for next year's business to be at least fairly good."

B. B. Quillen, president of the Cincinnati Planer Co. states: "I regard the prospects for next year as being good and look for considerable improvement in our business."

Milwaukee

"Optimism is the machine tool builder's chief asset," says E. J. Kearney, secretary of the Kearney & Trecker Corporation. "It buoys him with hope for the years immediately ahead. Present conditions justify his belief in the recovery of the basic industry in which he is engaged. Sound reasoning justifies his belief in the future. He is producing machines that do more and better work. Conditions were never more favorable to justify the optimism that is now his."

John Goetz, president of the Kempsmith Manufacturing Co., Milwaukee, said that judging by the experience of the past few months and the current run of business, as well as the volume of orders on the books, 1926 looks like a big year for the machine tool industry. Mr. Goetz is satisfied that the new year should surpass the one closing. There are numerous industrial groups, extensive users of metal-working equipment, that have just begun to catch their stride and doubtless will place in the hands of tool builders a relatively large number of orders.

W. J. Fairbairn, secretary, Milwaukee Metal Trades and Founders' Bureau, points to the gratifying employment situation at the close of the year as a promise of a continuance of good business in the machinery trade during 1926. Almost without exception, machine shops and foundries are reducing the usual vacation period during the holidays because delivery specifications from customers are unduly pressing.

Cleveland

Increased activity was the feature of the machinery and machine tool business in this district for the past fortnight. The volume of sales for this period has exceeded all expectations.

A consensus of opinions obtained from various dealers and producers indicates that the first six months of 1926 are going to be exceptionally good. The latter half of the year, however, is too far distant for any tangible opinion.

The Wellman-Seaver-Morgan Co.: "Demand for machinery and equipment of American design has shown a decided increase in the past year, and orders for American manufacturers have been coming from the ends of the earth. We look for no cessation of this condition in 1926."

Mr. Smith, of the Patterson Supply Co.: "I am inclined to believe that 1926 will be a reversal of 1925. Business for the first six months will be good and the last half of the year will be spotty."

Louis H. Mesler, of the Cleveland Planer Co.: "Based on orders closed and inquiries pending for the past month I believe 1926 will exceed 1925 in volume."

R. Stewart, of the Cleveland Punch and Shear Co.: "All branches of the metal trades line are busy and we look for a big year."

H. M. Rich, of the Cleveland Automatic Machine Co.: "Increased capacity and expansions are contemplated by a number of our clients and we look for a large share of business for the next four or five months."

Detroit

While some divergence of opinion is necessarily encountered when one attempts to secure forecasts for the machinery and machine tool field in 1926, there appears to be reason for believing that the New Year will find most representatives of machinery manufacturers enjoying continued prosperity.

The past three months have been among the busiest ever encountered in Detroit and southeastern Michigan. Sales reached a new high peak.

In discussing the outlook for 1926 with four Detroit dealers one gathers two optimistic view-points, one leaning more to pessimism, while the other cannot see more than 50 per cent of 1925 sales for the New Year.

Charles T. Bush, of the Chas. A. Strelinger Co., declares that "prospects are better for 1926 than they were in 1925. Sales of machinery and machine tools should be even greater than during this year. I base this opinion upon the large general employment to be found throughout the United States. The very fact that the nation is experiencing such a tide of good times speaks well for the outlook in the automobile industry."

The same cheerful view of matters is taken by C. L. Campbell, of the Cadillac Machinery Co. "Of course I'm optimistic," said Mr. Campbell. "There's going to be lots of business, especially in replacements. At this time I cannot see any great orders for entirely new equipment. The development stage for motors which will be shown at the automobile shows has passed. There may be some let-down during the first two months of the year."

A less vigorous brand of optimism is breathed by Robert C. Handloser, of the Motch & Merryweather Machinery Co. "We feel that the automobile business during 1926 will be only 90 per cent of what it has been this year. Figuring the general prosperity of the country as a whole to be 100 per cent, motor car production will fall away at least 10 per cent. This will mean a similar decrease in sales of machinery. I feel, however, that the recession will probably affect the automotive industry solely. We expect our sales to the adding machine and electrical manufacturers will exceed those of 1925.

On the other hand the local representative of one of the larger machinery manufacturers feels that the year will be good if sales total half of what they have been this year.

"Most of the plant expansion period in Detroit has passed," said this man. "Our business began to show a large increase last February, and the peak was not reached until November. The breaks have been with us during the last quarter, but it is too much to expect them to continue. 1926 will be a fair year, but certainly not a banner one."

Canada

In spite of the holiday and the approach of the inventory season there is a consistent demand for machinery and machine tools in Canada. This healthy condition is reflected throughout the metal-working industry in all parts of the Dominion.

Iron and steel production is being well maintained. The Algoma Steel Corporation has just blown in two additional furnaces to supply basic iron to the rolling mills. The British Empire Steel Corporation has received a 40,000-ton rail order from the Canadian National Railway.

Buffalo

"The outlook for 1926 indicates a business far beyond anything experienced this year," says Henry W. Wendt, president of the Buffalo Forge Co. "Inquiries and bids are more numerous, and unfilled orders on our books are larger than they have been in several years."

J. L. Osgood, president of the J. L. Osgood Tool Co. states, "I know from my recent world tour that conditions abroad are gradually improving. Tax difficulties retard business somewhat, but conditions are good for American manufacturers. The foreign demand for American equipment during the next ten years will be very good. I expect domestic business to be very good at least for the first six months."

Floyd Lowell, manager of the local office of Henry Prentiss & Co. believes that business in the first six months of 1926 will exceed the last months of this year. He said that competition and increased business activity will force the purchase of new machinery for greater production.

Chicago

The Chicago machine tool market shows very little of the reaction usually expected during Christmas week, dealers generally reporting business good, with inquiries especially satisfactory, and of a nature warranting a feeling of confidence. No important transactions are reported, the orders booked representing small lots of standard tools.

Inquiries coming in indicate that the first months of the new year will be a busy season. The Durnbuilt Steel Locker Co., of Detroit, the International Harvester Co., the New York Central Railroad Co., and the Pullman Co. are among those inquiring for tools and equipment for their respective shops and plants. A canvass of a few of the leading machinery dealers in Chicago elicited the following opinions respecting the outlook for 1926 in the machinery industry.

The E. L. Essley Machinery Co.: "In our line, we are looking forward to an excellent business for the coming year, par-

ticularly during the period between January and May. Railroads are expected to buy extensively of new shop equipment, but we look to agricultural implement manufacturers as the most important customers. Automotive plants seem to have bought shop equipment to an extent that will limit additional buying of tools to replacement necessities. The bulk of the business we look forward to during 1926, however, will come from general industrial plants. We feel most optimistic regarding the prospects for the machine tool industry during the year 1926."

Manning, Maxwell & Moore, Inc.: "Gaged by the good business in machine tools we have enjoyed for the last few months, and judging by the satisfactory character of the inquiries we are daily receiving, we look forward to the year 1926 as extremely encouraging. We anticipate a large railroad demand during the early part of the year. Should industrial conditions existing at the present time continue during 1926, the machine tool industry, as we know it, should enjoy a prosperous year."

Stocker-Rumely-Wachs Co.: "From our viewpoint, the year 1926 will be an exceptionally satisfactory one in the machine tool business. Conditions at this time are surprisingly good, and we are daily receiving inquiries of a kind that leads us to believe the coming year will forge ahead of 1925 in volume of business. Basing our opinion on the business we have done during the last three months, and the inquiries we are constantly receiving, our belief is that the year 1926 will prove a banner year in the machine tool industry."

Indianapolis

Due largely to the holiday period, sales during the last week declined, both in machinery and machine tools. There is an increase in inquiries, however, which leads the trade to believe that immediately after the first of the year business will return. One encouraging note in the industry is the present demand from small machine shops and other users of tools. These orders are small, but the field is broadening and marks a return of this class of buyer to the market.

Tool demands from the railroads and car foundries in the state are being temporarily curtailed. Traffic is heavy and immediately after the holidays many roads are expected to put in much motive power and rolling stock for repairs. Shops in this section are working steadily.

Probably the largest buyers now are the automobile factories. A large number of inquiries from farm implement factories indicates these plans will resume capacity production after the first of the year, and will be in the market for quantities of tools and some new machinery.

Dealers in used machinery report a fair business and say prospects are bright for next year.

New York

Just at this time of the year speculation is more in evidence than orders. Predictions fly thick, but unlike many other years, this season we have an almost universal opinion that the coming twelve months holds the greatest prospects for machinery business that hab ever been anticipated in a normal year.

The last two weeks in December saw this market literally flooded with inquiries. Railroads, industrials and small manufacturers are included in the prospects. The New York Central R.R. and the Brooklyn City R.R. both sent out lists for new equipment. The tendency of the present market is for machines for special production work, standard machines with certain new adaptations also being in demand.

Even with the year about at the close, sales last week were quite satisfactory, one group of orders being for three 36-in. lathes, one 48-in. car-wheel borer, a 90-in. axle turning lathe, five die sinking machines, three vertical shapers, two jig borers and several rotary surface grinders.

Grinders' Association Meets

E. S. Main, president of the United States Bearing Co., was the principal speaker at the recent convention in Indianapolis of the Central Cylinder Grinders' Association. George W. Kemp, of Muncie, presided at the meeting. Round table discussions featured the sessions. Other officers of the association present were A. M. Stewart, Toledo, vice-president; H. W. Lehmann, Cincinnati, secretary-treasurer, and J. R. Holl, of Louisville, C. I. Braddock of Columbia City, Ind., and C. W. Yount, of Indianapolis, directors.

General Electric to Locate Branch in St. Louis

Gerard Swope, president of the General Electric Co., has announced that the company has definitely decided to purchase a site for a manufacturing establishment in the city of St. Louis.

The tracts of real estate selected contain in the aggregate about 155 acres, of which all but 11 acres are within the city limits of St. Louis; the balance lies just beyond the city limits in St. Louis County.

The exact date on which construction will commence has not been determined. Neither has it been decided what character of apparatus will be manufactured in St. Louis.

The company carefully considered the advantages of locating a manufacturing branch in St. Louis, and satisfied itself that conditions there were excellent.

Railroads Spent Billion This Year

In accordance with the policy of the steam carriers to provide adequate transportation, Class I railroads during the year 1925 either actually spent or authorized to be spent approximately $1,200,000,000 in capital expenditures for improvements to the transportation plant and for the expansion of its capacity, including improvements in and additions to railway facilities, locomotives and cars.

Of that amount, approximately $775,000,000 will have been actually spent during the year. It is estimated that at least $425,000,000 of the amount authorized during the year will be carried over into 1926. What capital expenditures will be made during the coming year, however, cannot at this time be reckoned, being for the most part dependent on general business conditions and the outlook as to freight traffic during the year.

Russia Guessed Wrong

Russia's exportable surplus of wheat, it now is apparent, will not exceed 10,000,000 bushels. This is in decided contrast with the 300,000,000 bushel estimate of the Soviet authorities. At the time, it is recalled, the Department of Commerce warned that no such surplus was possible and that no machinery existed in Russia for the making of a statistical estimate of that character.

Apparently, however, the Russians really expected a much larger surplus, as large foreign orders were placed on the strength of the sale of wheat. It now has been found necessary to cancel many orders.

The Department of Commerce announces November production of motor vehicles as 336,358 passenger cars and 39,893 trucks, of which 327,617 passenger cars and 37,704 trucks were made in the United States.

What the Railroads Are Doing

The Baldwin Locomotive Works has received an order for 25 heavy freight locomotives from the Baltimore & Ohio Railroad. Business booked in December was ahead of that taken in November, which approximated $7,000,000, and which in turn was the largest month's business booked since February, 1923. Samuel M. Vauclain, president, will have the plant operating at 40 per cent in January and expects to increase that rate by about 5 per cent a month, reaching 60 per cent around May 1.

The American Locomotive Co. has received an order from the Missouri Pacific for ten 170-ton Mikado and five 150-ton Pacific engines.

The Consolidated Railroads of Cuba have ordered six new locomotives from the Baldwin Locomotive Co. to take care of the sugar crop. The American Locomotive Co. has announced the receipt of orders for fifteen locomotives from the Pacific Railroad Co., and for ten from the Chicago & Northwestern R.R.

The new type of oil-electric locomotive built by the General Electric Co. the American Locomotive Co. and the Ingersoll-Rand Co. was demonstrated last week by officials of the Long Island Railroad.

The Boston Elevated Ry. has placed a contract for approximately $500,000 worth of new equipment with the Westinghouse Electric and Manufacturing Co. The equipment is for sixty cars similar to those used in the Cambridge subway. They will be used on the new Shawmut extension.

Each of the new cars will have 200-horsepower Westinghouse motors. Electro-pneumatic control will be used with the safety control feature.

News of the Automotive Industry

"The General Motors Corporation should have another very satisfactory year in 1926," says Alfred P. Sloan, Jr., president of the corporation.

"Without attempting to forecast too far into the future, it now looks as if the first quarter of next year will be better than the corresponding period of 1925.

"With current prosperous conditions in many lines of industry and steady employment at high wages, all indications are that the public will buy at least as many motor vehicles during the coming year as this year, and if manufacturers keep their feet on the ground and do not overproduce, there seems to be no reason why industry as a whole cannot operate on satisfactory profits.

"The corporation is also expanding its operations in the export trade and we expect to attain a volume in overseas markets next year of around $100,000,000."

One of the latest reports about Hudson and Ford is to the effect that these companies will pool their material purchases in 1926. Such an arrangement would manifestly enable Hudson to further reduce costs. If these things are true, it is promised that Hudson will in 1926 achieve its mark of 2,000 cars a day and become the "Ford" of the six-cylinder motors.

Frederick J. Haynes, president of Dodge Brothers, Inc.; W. E. Scripps, vice-president of the Evening News Association, and Huston Rawls of Howe, Snow & Bertles, Inc., have been elected directors of Snow Motors, Inc., a company which is pioneering a development in the allied automobile field.

Snow Motors, Inc., manufactures a gasoline propelled vehicle which negotiates the deepest snowdrifts at six to eight miles an hour. These machines, consisting of a Ford tractor power plant mounted on two revolving cylinders which take the place of wheels, have performed almost remarkable feats in the snow.

The Stutz Motor Car Co. presented its new vertical eight-cylinder cars to dealers at the factor convention last week. The company received orders for 1,010 cars for immediate shipment. Stutz's entry into the eight-cylinder marks a radical change in policy. Sales in 1925 approximated 2,500 cars. The announcement to the trade of the new models brought 1,125 inquiries from existing dealers.

Personals

T. G. STRAUB has resigned as superintendent of the Evansville Tool Works, Evansville, Ind.

G. T. AITKEN, formerly sales manager for the Vonnegut Machine Co., of Indianapolis, is now associated with Fairbanks, Morse & Co.

J. P. FLETCHER has been appointed manager of the newly established office of the Independent Pneumatic Tool Co. in Buffalo, N. Y.

F. M. O'LAUGHLIN has been appointed Eastern sales representative for the Climax Engineering Co., of Clinton, Iowa. He will be located at 30 East 42nd St., New York.

F. R. MAYS, superintendent of the Illinois division of the Illinois Central Ry., has been appointed general superintendent of the Yazoo & Mississippi Valley R.R., succeeding Colonel E. H. Egan who has retired.

RALPH E. FLANDERS, general manager of the Jones & Lamson Machine Co., has been elected chairman of the Publications Committee of the American Society of Mechanical Engineers.

W. W. SAYERS, chief engineer of the Philadelphia plant of the Link-Belt Co., of Chicago, has been appointed chief engineer of the company and will be stationed at the general offices of the company in Chicago. George L. Morehead, who has been connected with the management of the company's Indianapolis plants, will succeed Mr. Sayers as manager of the Philadelphia plant.

Business Items

The King Machine Tool Co., of Cincinnati, has added another floor to its north bay. The added space will be used as an erecting department.

The Geiser Works of the Emerson-Brantingham Co., at Waynesboro, Pa., has been taken over and is being operated by the Geiser Manufacturing Co.

The Ludlum Steel Co., of Watervliet, N. Y., is making additions to its billet grinding department, new equipment being installed to take care of increased production.

The Ginsberg-Penn Co., of 18 E. 41st St., New York City has been appointed sales agent in the metropolitan district for the Ideal Concrete Machinery Co., of Cincinnati.

Nathan Klein & Co., Inc., of 208 Center St., New York, announce the sale of the entire stock of the company on Jan. 13, 14 and 15. The company will hereafter engage in the repair of electrical equipment.

The Eccles & Davies Machinery Co., of Los Angeles, Calif., has been incorporated under the laws of California. This company succeeds the Eccles & Smith Co. The new corporation is headed by Chris Eccles, and George A. Davies is vice-president and treasurer.

Obituaries

FRANK A. MERRILL, chief engineer of the Boston & Maine R.R., died at his home in Lynn, Mass., on Dec. 21. He was 68 years old.

BAXTER NEWELL, for many years connected with the Boston office of the Niles-Bement-Pond Co., of New York, died at his home in Wollaston, Mass., on Dec. 14. He was 56 years old.

HENRY M. NORRIS, secretary of the Cincinnati-Bickford Tool Co., of Cincinnati, died suddenly of heart failure on Dec. 24. The funeral was held on Tuesday, Dec. 29 from his home in that city.

Trade Catalogs

Grease Cups, Automatic. Berry Automatic Lubricators Corporation, 15 Broad St., New York, N. Y. "The Berry Automatic Grease Cup, Its Right to Existence and Its Potential Market Wherever Wheels Turn" is the title of an eight-page pamphlet on the organization of the company and the design and function of the product. The preparation and execution of the pamphlet is careful and artistic.

Machinery. Hill, Clarke & Co., 649 West Washington Blvd., Chicago, Ill. "The Why and Wherefore of Re-Manufactured Machine Tools" is an interesting explanation of the methods used by this organization in the purchasing and rebuilding of second-hand machinery. Several illustrations show parts of the plant interior and machine tools in the process of rebuilding.

Machinery. J. L. Lucas & Son, Inc., Bridgeport, Conn., has issued the Lucas List No. 65, eighty-eight, 5½x8½-in. pages. This catalog gives a classified list of the rebuilt equipment, owned by the company, with a brief description of each item, showing the specifications, capacity and price of the various models.

Motors, Electric. The Wagner Electric Corporation, St. Louis, Mo., has published Bulletin No. 137 on the Wagner wound-rotor, slip-ring polyphase motors. The bulletin contains a detailed description, with illustrations of the motors and of their characteristics. Speed-torque curves are also shown.

Motors, Gasolene. The Climax Engineering Co., Clinton, Iowa, has published Bulletins A, B, C, D, H and Sa-45 on the Climax equipment. The subjects of the pamphlets are, respectively, the K series, 4-cylinder; the T series, 4-cylinder; the R series, 4- and 6-cylinder engines; the K and the T portable power house; the oil-drilling unit and a general bulletin sketching the different applications of the equipment. They give full descriptions and contain illustrations of the models.

Reamers. The Wetmore Reamer Co., Milwaukee, Wis., has issued Catalog No. 22. This catalog shows the design and the construction of the Wetmore expanding reamers. Illustrations and the complete specifications for the different sizes of each model are included.

Scales. The Toledo Scale Co., Toledo, Ohio, has published a circular entitled "Invisible Losses" which gives illustrations and short descriptions of various types of Toledo scales.

Speed Reducers. De Laval Steam Turbine Co., Trenton, N. J. A sixteen-page pamphlet has been issued on the De Laval line of speed-reducers for use with standard or high-speed motors. The list includes worm reduction gears of the horizontal- and vertical-shaft as well as of the double-reduction types, also helical gears for low ratios and double-helical gears for high-power service. The illustrations include many colored views showing the details of construction, materials used and the pressure oiling system for heavy-duty service.

Speed Reducers. D. O. James Manufacturing Co., 1114 West Monroe St., Chicago, Ill. Catalog No. 99, 8x10½ in., three hundred and twenty pages covers the general line of transmission equipment handled by this company. A history of the organization, entitled "Forty Years of Progress," is given in the book. Each type of gear and speed reducer is explained and illustrations are given. Tables show the various sizes and capacities of the equipment.

The line cataloged includes gears made of various materials, racks, sprocket wheels, gages, internal gears, shafting and different models and types of speed reducers.

The catalog includes sixty-five pages of general engineering data and useful tables. Among these are tables of gear specifications, such as horsepower rating, characteristics and pitch diameters, keyway specifications for different types, S. A. E. steels and heat-treatment formulas, screw-thread-dimensions, trigonometrical formulas, weights of steel stock and several pages of engineering data. These tables form an imposing engineer's handbook.

Trucks, Lift. The National Scale Corporation, Chicopee Falls, Mass., has issued a catalog showing the various models of lift trucks manufactured by the company. These include also the scale elevating trucks for weighing and transportation purposes. Tables are given listing the models and their specifications.

Turret Lathes. The Gisholt Machine Co., Madison, Wis., has published a folder describing its line of turret lathes and showing time estimates for a sample of turret-lathe work. Illustrations of several models of the line are included.

Calendar of Local Meetings

National Association of Cost Accountants

New York Chapter. Jan. 12. Income Tax.

Albany Chapter. Jan. 13. Cost Problems and Methods in the paper mill and the printing plant.

Worcester Chapter. Jan. 14. Standard Costs and Variances.

Mohawk Valley Chapter. Jan. 18. Burden Distribution.

Hartford Chapter. Jan. 19. Relation of Cost Accounts to Taxation.

Los Angeles Chapter. Jan. 19. Development of Cost Accounting.

Scranton Chapter. Jan. 19. Debatable Points in Cost Accounting.

Twin Cities Chapter. Jan. 19. Carrying Out the Budget Plan.

Syracuse Chapter. Jan. 20. Cost Analysis to Disclose Waste in Distribution.

Cleveland Chapter. Jan. 20. Inventory Methods.

Rochester Chapter. Jan. 20. Business Forecasting.

Chicago Chapter. Jan. 21. Planning for Reduced Production Costs.

Boston Chapter. Jan. 28. Accounting for Depreciation.

Buffalo Chapter. Jan. 28. Factory Overhead.

San Francisco Chapter. Jan. 28. Relation of Business Cycles to Costs and Prices.

Society of Automotive Engineers

New York. Jan. 14. Annual dinner, Hotel Astor.

Detroit. Jan. 26 to 29. Annual meeting.

American Society for Steel Treating

Buffalo. Jan. 21 and 22. Winter sectional meeting, Hotel Statler.

Hartford. June. Spring sectional meeting.

American Society of Mechanical Engineers

New Haven. Jan. 12. Fuels for Domestic Heating.

Washington, D. C. Jan. 12. Super-Power. Joint meeting with A.I.E.E.

New York. Jan. 14. Welded Pressure Vessels.

New York. Jan. 18. Domestic Heating.

Meriden. Jan. 19. Manufacturing and Management Problems.

Forthcoming Meetings

American Society for Steel Treating. Winter sectional meeting, Hotel Statler, Buffalo, N. Y., Jan. 21 and 22. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, General Motors Bldg., Detroit, Jan. 26 to 29. Coker F. Clarkson, secretary and general manager, 29 West 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—There is considerable forward buying of pig iron for first quarter delivery in the current market; quotations are unchanged from a week ago. In steel, semi-finished material shows more activity in actual demand than finished. In the latter class, structurals are slower moving than a week or so ago and bars are bringing mostly inquiries. Present quotations at Pittsburgh mills are, $2@$2.10 per 100 lb. for bars; $1.90@$2 for shapes; $1.60@$2 for plates, the minimum applying on exceptional tonnages.

Non-Ferrous Materials—Fabricated brass and copper are down about ¼c. per lb. from the Dec. 18 level. Linseed oil dropped 0.7c. per lb., f.o.b. New York, during the past week.

(All prices as of Dec. 26)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	24.27
Southern Ohio No. 2	24.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.37
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.16
Virginia No. 2	29.17
Basic	23.16
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	26.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	22.27
Basic	22.27
Bessemer	22.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	5.00@5.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.50	3.89	3.15	3.50
No. 12	2.55	3.94	3.20	3.55
No. 14	2.60	3.99	3.25	3.60
No. 16	2.70	4.09	3.35	3.70
Black				
Nos. 18 to 20	3.15	4.15	3.75	3.90
Nos. 22 to 24	3.20	4.20	3.80	3.95
Nos. 26 and 27	3.25	4.25	3.85	4.00
No. 28	3.35	4.35	3.95	4.10
Galvanized				
No. 10	3.60	4.35	4.25	4.25
Nos. 12 to 14	3.70	4.45	4.35	4.35
No. 16	3.85	4.60	4.50	4.50
Nos. 18 to 20	4.00	4.75	4.65	4.65
Nos. 22 to 24	4.15	4.90	4.70	4.80
Nos. 26 and 27	4.30	5.05	4.95	4.95
No. 28	4.60	5.35	5.10	5.25

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameters Inches External	Diameters Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness Decimal	B.W.G. and Fractions	Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	6.35	6.35	6.80
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.10
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	50@60%	55%	60%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 3/16@½-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.25
Tin, 5-ton lots, New York			64.25
Lead (up to carlots) E. St. Louis	9.15	New York	10.00
Zinc (up to carlots) E. St. Louis	8.70	New York	9.87½

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	23.50	21.25	20.00
Copper sheets, base	22.50	22.50	22.75
Copper wire, base	19.62½	16.50	16.50@16.75
Copper bars, base	22.12½	21.00	22.37½
Copper tubing, base	24.50	24.50	24.75
Brass sheets, base	19.12½	18.87½	19.37½
Brass tubing, base	23.75	23.50	27.37½
Brass rods, base	16.87½	16.62½	17.12½
Brass wire, base	19.62½	19.37½	19.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	28@29	28.00	28.03
Zinc sheets (casks)	12.00	12.60@12.95	12.27
Solder (½ and ½), (case lots)	40.25	41.00	38@42

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	80.75
Commercial genuine, intermediate grade	56.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	14.50

Nickel, f.o.b. refinery, cents per lb.:
Ingots..... 31.00 Electrolytic.. 38.00 Shot..... 32.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.75@12.00	11.25	11.50@12.00
Copper, heavy, and wire	11.50@11.75	11.50	11.25@11.75
Copper, light, and bottoms	9.50@10.00	9.50	10.00@10.50
Heavy lead	8.00@8.50	7.50	7.75@8.25
Tea lead	6.00@6.25	5.00	6.75@7.25
Brass, heavy, yellow	7.50@7.75	7.25	7.50@8.00
Brass, heavy, red	9.50@10.00	9.50	8.75@9.25
Brass, light	6.00@6.50	6.00	7.25@7.75
No. 1 yellow rod turnings	8.25@8.75	8.00	7.50@8.00
Zinc	5.25@5.50	4.75	5.00@5.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade: IC,	14x20	$11.25	$11.45	$11.50
"A" Grade: IC,	14x20	8.85	9.40	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.85	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.20
Cotton waste, colored, per lb.	.10@.15½	.10	.17
Wiping cloths, washed white, per lb	.17	36.00 per M	.15½
Sal soda, per 100 lb. keg	2.25	2.25	2.75*
Roll sulphur, per 100 lb. keg	3.75	3.75	4.50
Linseed oil, per gal., 5 bbl. lots	.93¾	1.10	1.02
Lard cutting oil, 25% lard, per gal.	.55	.50	.54
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.35	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*In 175 lb. kegs.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.0415	.0405
Brass rods	per lb	.1687½	.1737½	.1637½
Solder (½ and ½)	per lb.	.4025	.40	.40@.41
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.29
Belting, leather, medium	off list	40–5%	40%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.46	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	29.48	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.41	1.49
Cloth	3.55	2.67	3.20
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		5.50@5.75
Coke, prompt foundry, Connellsville	per net ton		6.50@7.00
White lead, dry or in oil	100 lb. kegs		New York, 15.25
Red lead, dry	100 lb. kegs		New York, 15.25
Red lead, in oil	100 lb. kegs		New York, 16.75

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ⅞-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4$\frac{1}{16}$-in. $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{1}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1⅛ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ⅜-in., $7.00* per 100 lb. at New York warehouses; ½-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Fla., Tampa—Flamova Lumber Co., 2728 Florida Ave.—planing mill machinery.

N. J., Newark—Holden Tube & Bending Co., 889 Frelinghuysen Ave., swaging machine for dies, 5 in. long and 1½ in. wide.

N. J., Patterson—Ace Machine Co., Inc., 929-935 Market St.—36 in. V. T. Bullard, side head, boring mill, late type and one 60 in. rapid production boring mill with two heads on the rail, motor drive, (used).

N. Y., Rochester—Ogden P. Adams Co., Inc., 246 St. Paul St.—high speed riveting hammers, Baker drills, 24 x 24 x 6 ft. Ingersoll vertical head mill.

N. Y., Rochester—North East Electric Co., 348 Whitney St.—duplex horizontal drill (used).

N. Y., Schenectady—General Electric Co., River Road—3 ton 43 ft. 6 in. span low head room crane for Ft. Wayne, Ind., 3 ton 23 ft. span low head room, crane for Schenectady, N. Y., two 2 ton cranes for West Philadelphia, Pa.

O., Cincinnati—Cincinnati Shaper Co., Elam and Garrard Sts.—30 ton Lucas power forcing press (used).

Pa., Johnstown—National Radiator Co.—No. 3 Simpson intensive foundry mixer and No. 3 Simpson bucket loader for mixer (used).

Pa., Pittsburgh—National Tube Co., Frick Bldg.—hack saws, small drills and lathes for McKeesport and Gary plants.

Pa., Pittsburgh—Riter Conley Co., Oliver Bldg.—15 ton power house crane for Midland Coke & Iron Corp., St. Louis, Mo.

S. C., Greenwood—Greenwood Welding Co., Box 581—woodworking machinery for the manufacture of cotton mill bobbins.

Wis., Marshfield—School District No. 1, M. Hansen, Clk.—manual training machinery and equipment for proposed 3 story, 36 x 207 ft. addition to vocational and junior high school. Estimated cost $225,000.

Ont., Collingwood—D. Shaw—woodworking equipment for the manufacture of wood specialties, cost $15,000.

Que., Lac au Saumon—Paradis & Freres cut off saws, rip raws, etc.

Que., La Sarre—Letourneau & Lambert—rip saws and woodworker.

Que., Mont Laurier—S. Onelletts & Co.—sawmill machinery.

Que., Montreal—G. Pepin, 107 Des Carneres St.—lathe and small tools for auto repair shop.

Opportunities for Future Business

Ala., Gadsden—Etowah Foundry & Machinery Co., R. B. Taliaferro, Pres., plans the construction of a plant to replace fire loss.

Calif., Los Angeles—Bd. of Education, awarded general contract for the construction of a group of science and shop buildings for Fremont High School. $134,825. Balance of contracts will be awarded later. Noted Dec. 3.

Calif., Martinez—Contra Costa County, will build a 1 story, 65 x 125 ft. machine shop for repair of road equipment. R. R. Arnold, Co. Surv. Noted Nov. 5.

Calif., San Leandro—San Leandro Junior High School Dist. had plans prepared for the construction of a 2-story school including shop buildings, etc. Estimated cost $240,000. E. W. Cannon, Ray Bldg., Oakland, Archt.

Conn., Bridgeport—Mack Motor Co., 673 Connecticut Ave., awarded contract for the foundation of a garage and service station on Ash Creek. Estimated cost $150,000. Noted Oct. 15.

D. C., Washington—Capital Garage Co., R. C. Jones, Pres., has recently purchased site and plans the construction of a garage at 1318-1320 New York Ave. Estimated cost $1,000,000. A. B. Heaton, Archt.

Ga., Atlanta—The McKeown Bros. Inc., F. T. Newell, Secy., 112 West Adams St., has purchased a 5 acre tract of land and plans the construction of a factory for the manufacture of wood trusses for roofs, etc., on Glenwood Ave. here. Estimated cost $150,000.

Ga., Atlanta—The Simmons Co., 23 Jones Ave., manufacturer of beds, plans the construction of addition to plant to double the capacity, also a 3 story office unit. Estimated cost $500,000. Morgan & Dillon, Grant Bldg., Archts.

Every one of these items is reported by our authorized correspondents who are instructed to verify every item sent in. This free weekly service is published in the interests of the buyer and the seller, to bring them together and get machinery moving.

Everything possible is done to insure authenticity and timeliness.

Your co-operation is invited in helping us maintain this service at the highest efficiency.

BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

Ga., Atlanta—The Warren Co., V. P. Warren, Pres., 875 East Fair St., plans the construction of addition to plant for the manufacture of refrigerators to double the capacity.

Ill., Chicago—A. S. Alschuler, 28 East Jackson Blvd., Archt., will soon receive bids for the construction of a 4 story, 100 x 100 ft. factory for the manufacture of metal novelties for Dowst Bros. Co., 120 Ann St. Estimated cost $150,000.

Ind., Evansville—American Woodcraft Corp., will build a 60 x 360 and 60 x 200 ft. furniture factory on West Pennsylvania St. Estimated cost $120,000. A. E. Neucks, Old State Bank Bldg., Archt.

Ind., Mishawaka—American Foundry Co., awarded contract for the construction of a 2 story, 100 x 200 ft. steel plant. Estimated cost $40,000.

Mass., Brookline (Boston P. O.)—Meltzer & Snyder, Strathmore Road, awarded contract for the construction of a 1 story, 135 x 176 ft. repair and service garage on Station St. Estimated cost $100,000.

Mass., Cambridge (Boston P. O.)—P. P. Henry, 9 Decatur St., is having plans prepared for the construction of a repair and service garage. Estimated cost $40,000. Private plans.

Mass., Chelsea (Boston P. O.)—J. Seeley, c/o S. S. Eisenberg, 46 Cornhill, Boston, Archt., is receiving bids for the construction of a 1 story repair garage, battery and service station on Park St. Estimated cost $40,000.

Mass., Somerville—N. E. Dressed Meat & Wool Co., 174 Somerville Ave., is having revised plans prepared for the construction of a 1 story, 35 x 160 ft. garage and repair shop on Medford St. Estimated cost $40,000. A. E. Bump, 60 North Market St., Boston, Archt. Former bids rejected.

Mass., Worcester—Shikes, Long & Waldron, 18 Tremont St., Boston, is having plans prepared for the construction of a 3 story, 110 x 140 ft. garage here. Estimated cost $150,000. S. S. Eisenberg, 46 Cornhill, Boston, Archt.

Mo., Joplin—Bunker Hill & Sullivan Co., plans the construction of an electrolytic zinc plant. Estimated cost $1,000,000.

Mo., St. Louis—A. E. Schmidt Co., 1113 Pine St., manufacturers of billiard tables, etc., is having preliminary plans prepared for the construction of a 3 story, 45 x 109 ft. factory at 1809-1811 Olive St.

Neb., Lincoln—Bd. of Education, J. G. Ludlam, will receive bids until Jan. 28 for the construction of a 3 story, 192 x 328 ft. junior high school including shops, etc. Estimated cost $650,000.

N. J., Flemington—Universal Joint Co., Plainfield, plans the construction of a 2 story, 65 x 100 ft. addition to plant, as first unit. Engineer not selected.

N. J., Perth Amboy—Middlesex County Vocational School Bd., A. C. Clark, Pres., plans the construction of a vocational school on New Brunswick Ave. Estimated cost $270,000.

O., Cleveland—Aluminum Co. of America, C. O. Tessier, Plant Mgr., 2610 Harvard Ave., awarded steel contract for the construction of a 1 story, 50 x 300 addition to foundry. Estimated cost $100,000.

O., Newark—Simpson Foundry & Engineering Co., is having plans prepared for the construction of a 1 story, 120 x 200 ft. factory. Estimated cost $650,000. Private plans.

Ore., Portland—G. T. Mickle Lumber Co., North Portland, is having plans prepared for the construction of a paper mill to use refuse from present sawmill, capacity of saw mill to be increased from 300,000 to 600,000 ft. per 8 hr. shift. Estimated cost $1,000,000. Architect and engineer not announced.

Pa., Columbia—O. K. Clutch & Machinery Co., awarded contract for the construction of a 2 story, 70 x 140 ft. plant for the manufacture of hoists and compressors. Estimated cost $40,000.

Pa., Philadelphia—Duff Nash Motor Co., 1113 South Broad St., plans the construction of a 3 story, 86 x 100 ft. sales and service garage at Broad St. and Washington Ave. Estimated cost $150,000. P. S. Tyre, 114 South 15th St., Archt.

Pa., Philadelphia—I. Halpern Bros. & Co., Hancock and Berks Sts., awarded contract for the construction of a metal plant including a 1 story, 50 x 150 ft. warehouse, 24 x 50 ft. office and 50 x 100 ft. smelting building at Carbon and Erie Sts.

Pa., Pittsburgh—Frank L. Saupp Inc., Center Ave., awarded contract for the construction of a 2 story, 106 x 150 ft. auto sales and service building. Estimated cost $250,000. Noted Sept. 3.

Wis., Two Rivers—Aluminum Goods Mfg. Co., 15th and Franklin Sts., Manitowoc, awarded contract for the construction of a 4 story, 50 x 62 and 1 story, 50 x 82 ft. additions to plant here.

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American Machinist

KENNETH H. CONDIT and FRED H. COLVIN, *Editors*
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It is a pleasure to wish you what we are convinced will be your portion, and that is—

A Happy and Prosperous New Year

AMERICAN MACHINIST

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Obsolete Machine Tools Hamper Your Skilled Men

Your machine tool operators cannot give you the best they have, unless you give them modern machine tools, with which to do their work.

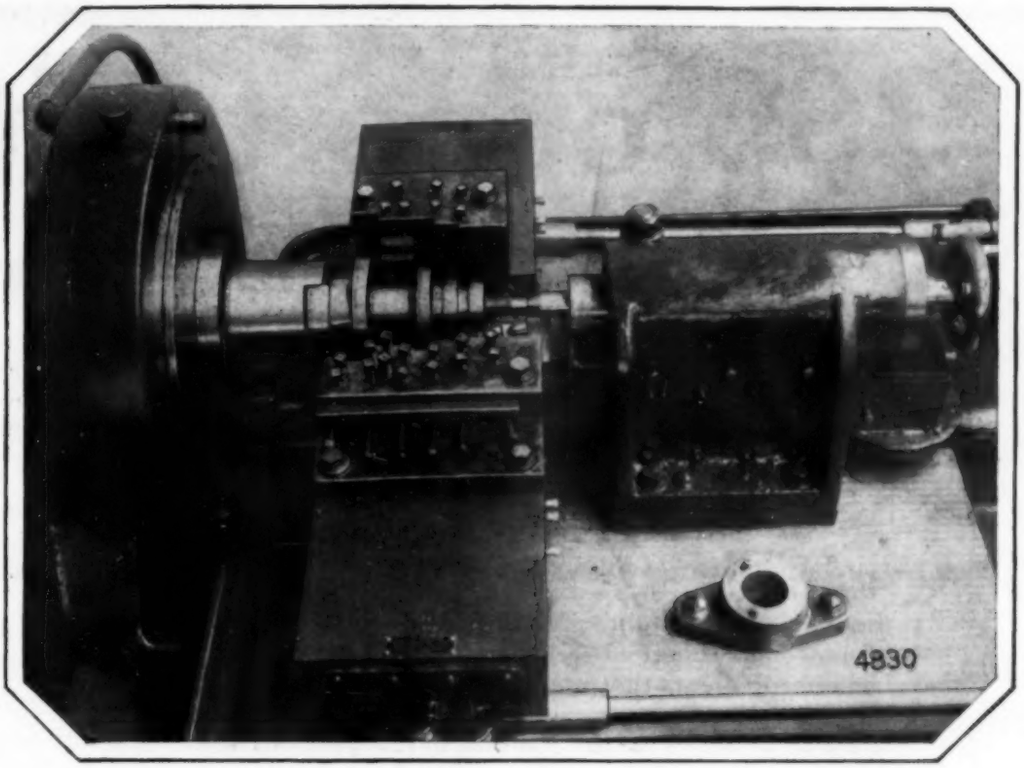
Your men are no less an asset than capital. You have an investment in them. If you hobble and handicap them with obsolete tools, you are decreasing the earnings of your investment in men and machinery both.

Larger wages for your men, bigger dividends in productiveness, larger savings upon labor turnover and factory costs—all these can be earned by replacing obsolete equipment with modern

Machine Tools—the Master Tools of Industry

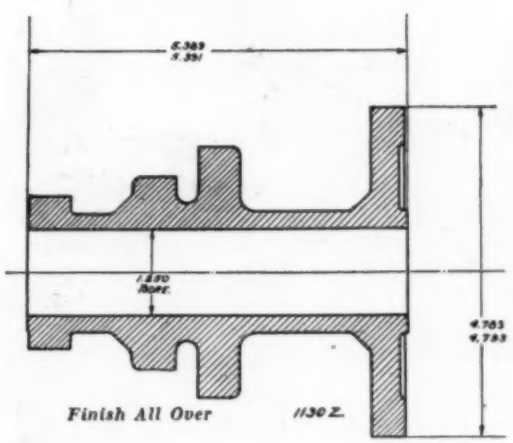
NATIONAL
MACHINE TOOL BUILDERS'
ASSOCIATION

N.M.T.B.A.



Note how simple the tooling is for this steel forging cluster gear being made in the plant of a widely known automobile manufacturer.

The Simplimatic makes A Record on Cluster Gears



Drawing of cluster gear shown in above picture

2 Men
4 Simplimatics
A finished cluster every 2½ minutes floor to floor time.

The above production is typical of Simplimatic performance. Parts are produced on The Simplimatic at the lowest net cost per piece, all things considered, including investment, tool upkeep, floor space, supervision and labor.

Let us tell you how The Simplimatic will increase your production and lower your cost.

Gisholt Machine Company
1000 EAST WASHINGTON AVENUE
MADISON, WISCONSIN

GISHOLT

365 opportunities

Will you take

The New Year will be full of opportunities for the man who is prepared. If you, Mr. Manufacturer, want business throughout the coming year one of your main considerations should be the installation of modern equipment.

Why?

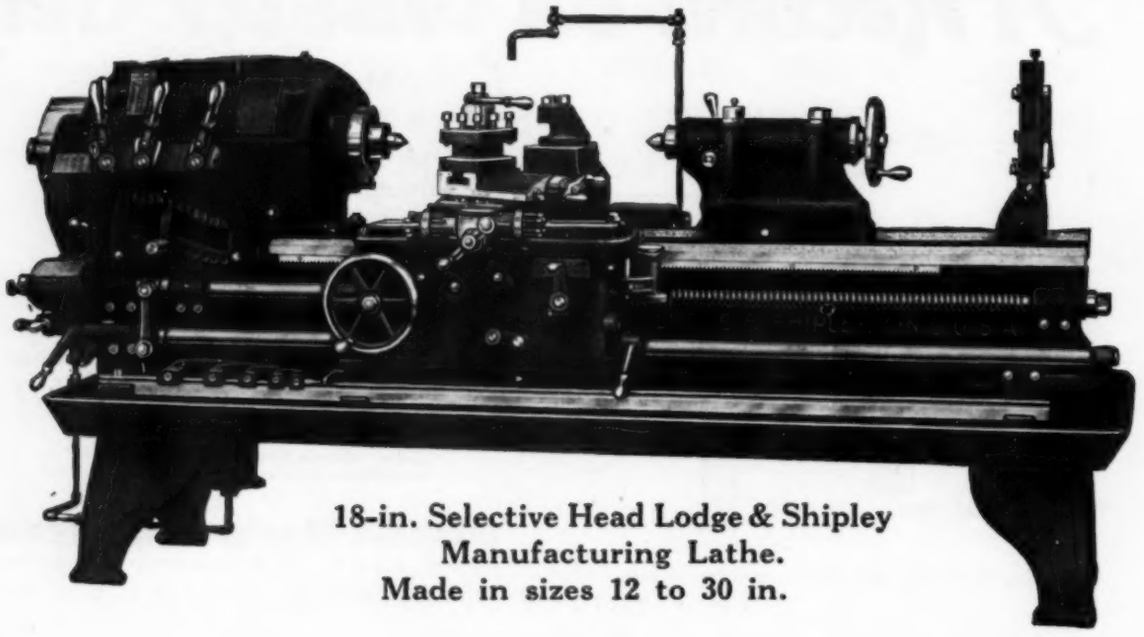
The why of it is this:

Modern equipment enables you to do *more* work, consequently cutting down the time per piece.
It maintains a high standard of accuracy.
It is more adaptable than earlier types.
It has improvements that mean a dollars and cents saving to you.
It is easier to operate.
It offers an incentive for the operator to always do his best.
It means, in the long run, bigger returns for you—

Larger profits and better work!

Modern equipment will help you beyond your greatest expectations.

The Lodge & Shipley Manufacturing Lathe



18-in. Selective Head Lodge & Shipley Manufacturing Lathe.
Made in sizes 12 to 30 in.

Send for booklet

The Lodge & Shipley
Cincinnati,

just ahead!

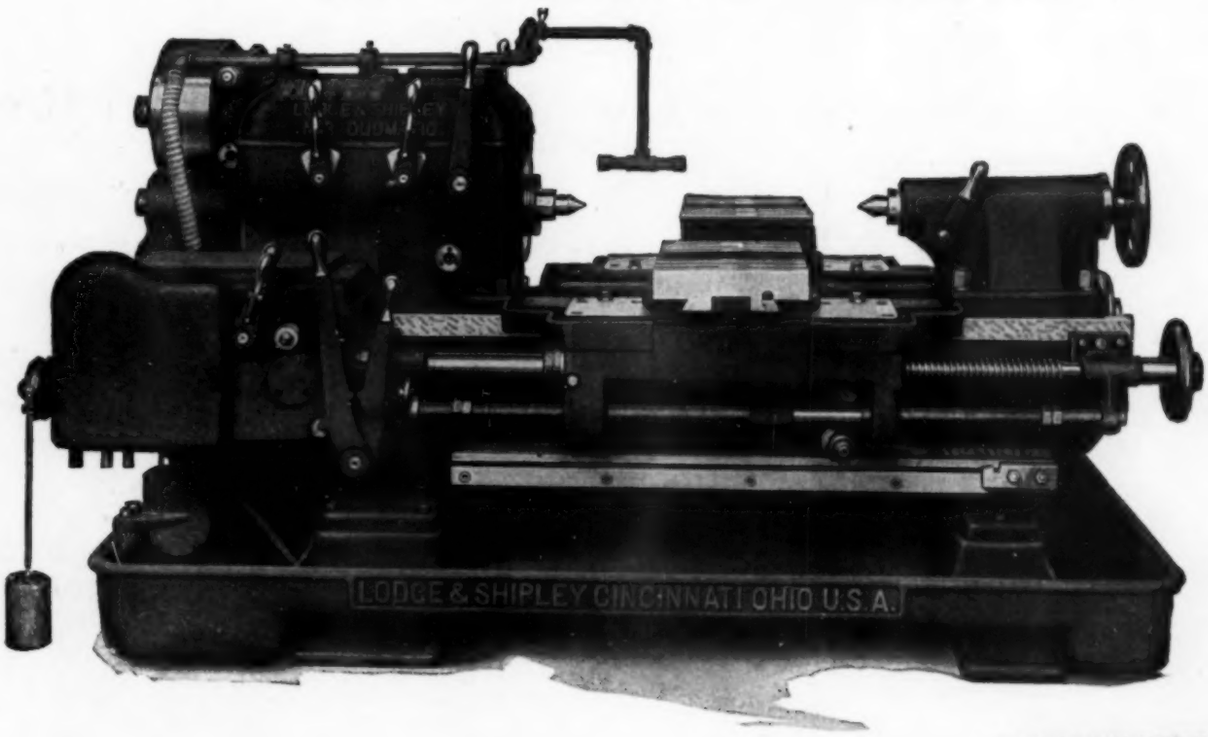
advantage of them?

Modern equipment enables you to secure your profits without the necessity of "tacking it on" when the job is finished.

The successful manufacturer gets his profits through better factory methods rather than the "tacking on" process. Better factory methods mean the use of modern equipment—equipment that is designed to cope with present-day demands and turn the work out with a profit.

You, Mr. Manufacturer can do this, but not with old shop-worn machinery. Make up your mind to get all the business you possibly can during the coming year. The use of modern machinery will be the governing factor of your success. Consider it seriously! Then act.

The Lodge & Shipley DUOMATIC



Machine Tool Co.
Ohio

Send for booklet

CINCINNATI
MAKES MORE MACHINE TOOLS IN LARGER VARIETY THAN ANY OTHER CITY IN THE WORLD
TO SEE ANY UP TO DATE MACHINE TOOL COME TO
CINCINNATI

WHAT'S

Will industrial activities be greater or less in 1926?

In either event it is certain that 1926 will find a general throwing out of obsolete equipment. Old machines will be replaced with new ones. And the new machines will have productive features which increase output and lower cost.

Cincinnati Millers will play a large part in the lowering of cost for industry in 1926.

And we are ready to help you find out just what it is costing you to keep these obsolete machines at work. Get in touch with our Agent and make an appointment for our Milling specialist who will be glad to go over your milling jobs and recommend the *right* machine for your particular work—the machine that will increase your profits.

Get rid of obsolete machines. Take advantage of the patented highly productive features of Cincinnati Millers.

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Buffalo, N. Y.—Henry Prentiss & Co., Inc.
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Cleveland, Ohio—Motch & Merryweather Mchy. Co.
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Montreal, Que., Can.—Rudel, Belnap Mchy. Co. Ltd.
New Orleans, La.—Woodward, Wight & Co., Ltd.
New York, N. Y.—Henry Prentiss & Co., Inc.
Omaha, Nebr.—American Machinery & Supply Co.
Philadelphia, Pa.—W. H. Shipley Mchy. Co.
Pittsburgh, Pa.—Motch & Merryweather Mchy. Co.
Portland, Oregon—Zimmerman-Wells-Brown Co.
Rochester, N. Y.—Henry Prentiss & Co., Inc.
Salt Lake City, Utah—Salt Lake Hdwe. Co.
San Francisco, Calif.—Harron, Rickard & McCone Co.
Seattle, Wash.—Hallidie Mchy. Co.
Shreveport, La.—Woodward, Wight & Co., Ltd.
Spokane, Wash.—General Machinery Co.
St. Louis, Mo.—Elliott & Stephens Mchy. Co.
St. Paul, Minn.—Robinson, Cary & Sands.
Syracuse, N. Y.—Henry Prentiss & Co., Inc.
Tampa, Fla.—Woodward, Wight & Co., Ltd.
Toronto, Ont., Canada—H. W. Petrie, Ltd.

CINCINNATI GRINDERS

AHEAD?

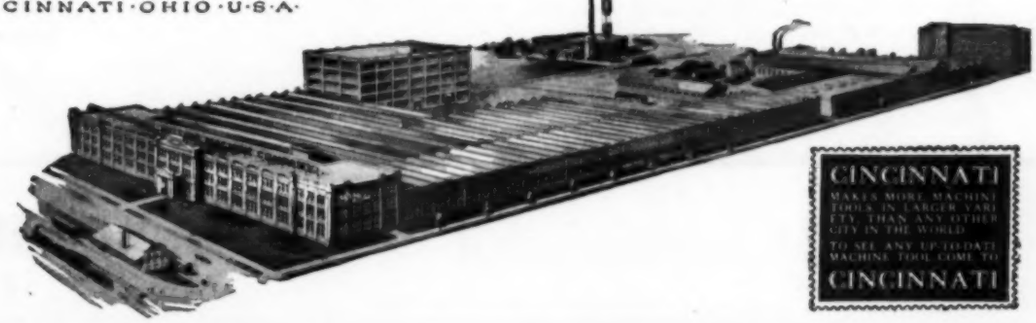
As we enter our forty-second year in the manufacture of Milling Machines and Grinders, we extend to you a most cordial invitation to visit our plant in Cincinnati.

We hope that during 1926 you will make definite plans to visit us for we feel that we have much that will interest you in men, methods and machines.

You will find a complete line of our products in a running exhibit and on actual production on customers' work, specially equipped for time-saving operations solving milling and grinding problems, similar to those which you will meet in your own plant. Send for our book, "Tool Room Methods." It tells of many interesting things to be seen in our plant.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI·OHIO·U·S·A·

"Why hamper your skilled men with obsolete equipment?"



CINCINNATI
MAKES MORE MACHINE TOOLS IN LARGER VARIETY THAN ANY OTHER CITY IN THE WORLD
TO SEE ANY UP-TO-DATE MACHINE TOOL COME TO
CINCINNATI

CINCINNATI MILLERS

Matthew Baird

1817 1877

Baird, the locomotive builder, was born near Londonderry, Ireland, in 1817. After a common school education he became assistant to a professor of chemistry.

In 1834 he went to New Castle, Del., and entered into copper and sheet metal work.

Four years later he entered the employ of the Baldwin Locomotive Works where he remained until 1850.

In 1854 he returned to the Baldwin Works and became partner to Matthias Baldwin. Upon the death of the latter in 1866, he became sole proprietor of the establishment.

Mr. Baird designed many improvements in mechanical appliances, especially locomotive machinery.

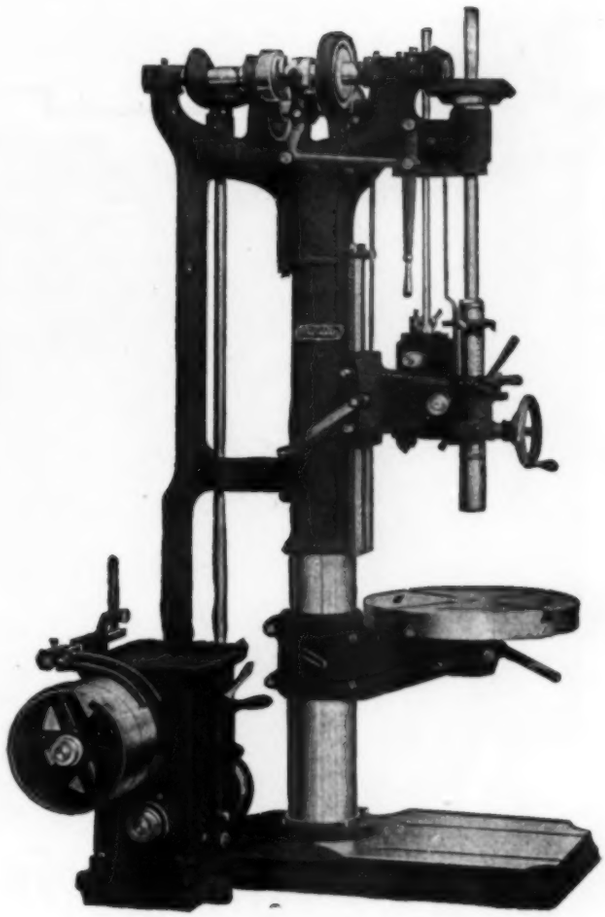
He invented various devices for consuming smoke which were adopted on all roads using bituminous coal for fuel. Mr. Baird, after a useful and busy life, died May 19, 1877.

The productivity of a machine is the measure of its worth.

Only as far as the masters of industry utilize the knowledge of specialists can they hope to progress.

The Cincinnati Bickford
Oakley, Cincinnati,

aders



THERE are no short cuts on the road to achievement. Costly experiments and rigid tests must follow one upon another if success is achieved.

The first practical upright drilling machine was placed upon the market soon after 1837. It was hand fed and of limited speeds. In 1874, the Bickford Drilling Machine made its advent. It had eight speeds, two power feeds and a quick advance and return.

In 1899 the "Cincinnati" was developed, having automatic trip, friction back gear, depth gauge, tapping attachment and a worm-wheel elevating device for table.

The Cincinnati Bickford appeared in 1909 with a speed box and back gears, furnishing sixteen changes of speed, having an equal amount of power on all speeds and showing at a glance the correct speed for each size of drill.

Cincinnati Bickford Upright Drills are leaders in the world's progressive plants. When changes in design warrant, Cincinnati Engineers will make them.

Argument betrays a shallow mind as everyone of experience holds the same opinion.

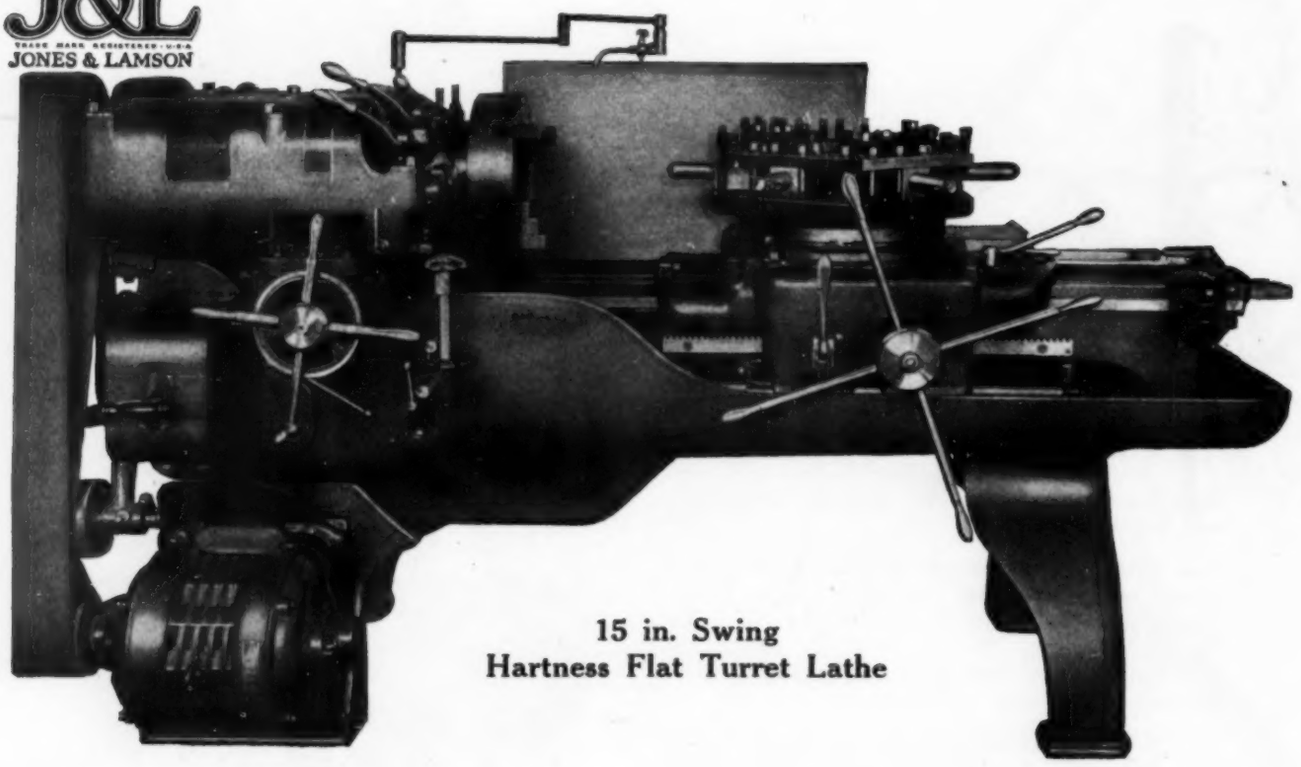
CINCINNATI BICKFORD UPRIGHT DRILL

CINCINNATI
MAKES MORE MACHINE TOOLS, IN LARGER VARIETY, THAN ANY OTHER CITY IN THE WORLD.
TO SEE ANY UP-TO-DATE MACHINE TOOL COME TO
CINCINNATI

Tool Company
Ohio, U. S. A.

Established 1874

J&L
JONES & LAMSON



15 in. Swing
Hartness Flat Turret Lathe

A turret lathe is as good a lathe as its tools are good metal removers—no better!

The Hartness Flat Turret Lathe with cross-sliding headstock brought a new era in chucking work, because it gave high speed steel tools a chance to do their work as metal removers.

J&L Jones & Lamson

Springfield,

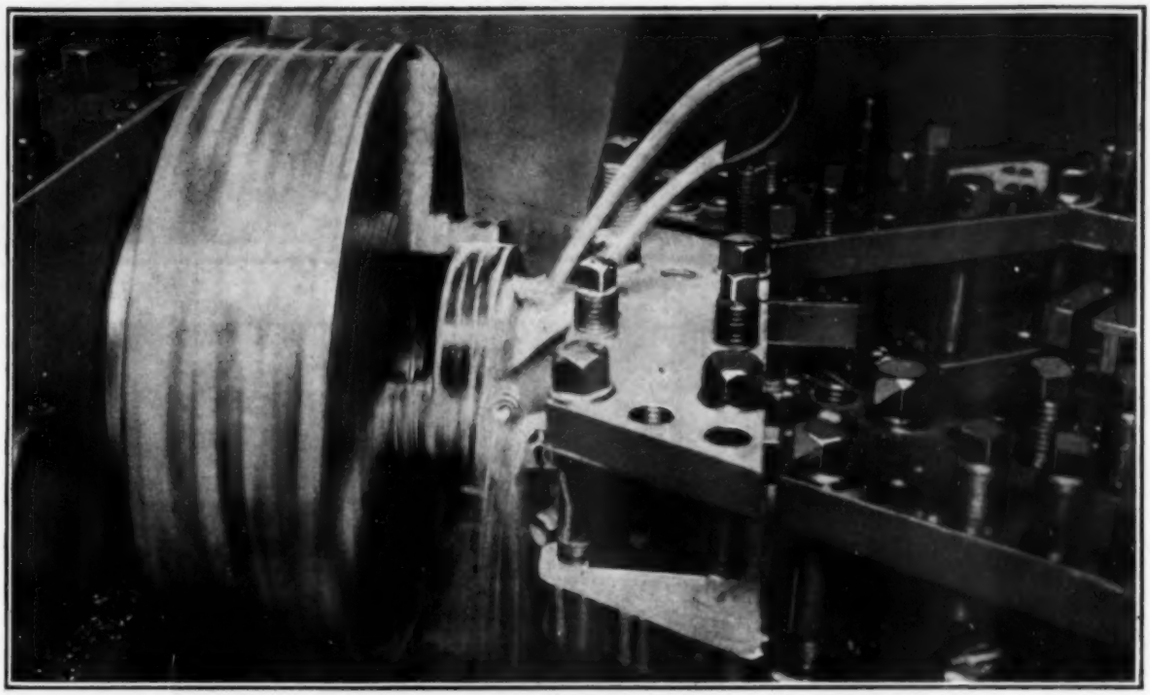
Hartness
Flat Turret Lathe

Fay
Automatic Lathe

Hartness
Double Spindle Flat Turret Lathe

BRANCH OFFICES
SAN FRANCISCO, CALIFORNIA, 503 Market Street
LONDON, ENGLAND, 19-21 Water Lane, Queen Victoria Street
HOLLAND, Spliethoff, Beeuwkes & Co., Luevehaven, Wz., 159 Rotterdam

J&L
JONES & LAMSON



This picture shows *how* high speed steel tools will cut and *why*.

The work is held firmly and rigidly with minimum overhang from spindle bearing.

Every tool on the flat, rigidly supported turret is set with minimum overhang.

The strength of the tool in parting the chip is nicely mated to the power of the work spindle in forcing the cut.

This balance of tool strength to headstock power is only possible because of the FLAT TURRET and CROSS-SLIDING HEADSTOCK.

Machine Company J&L JONES & LAMSON

Vermont, U. S. A.

Hartness Automatic Die

Flanders Ground Tap

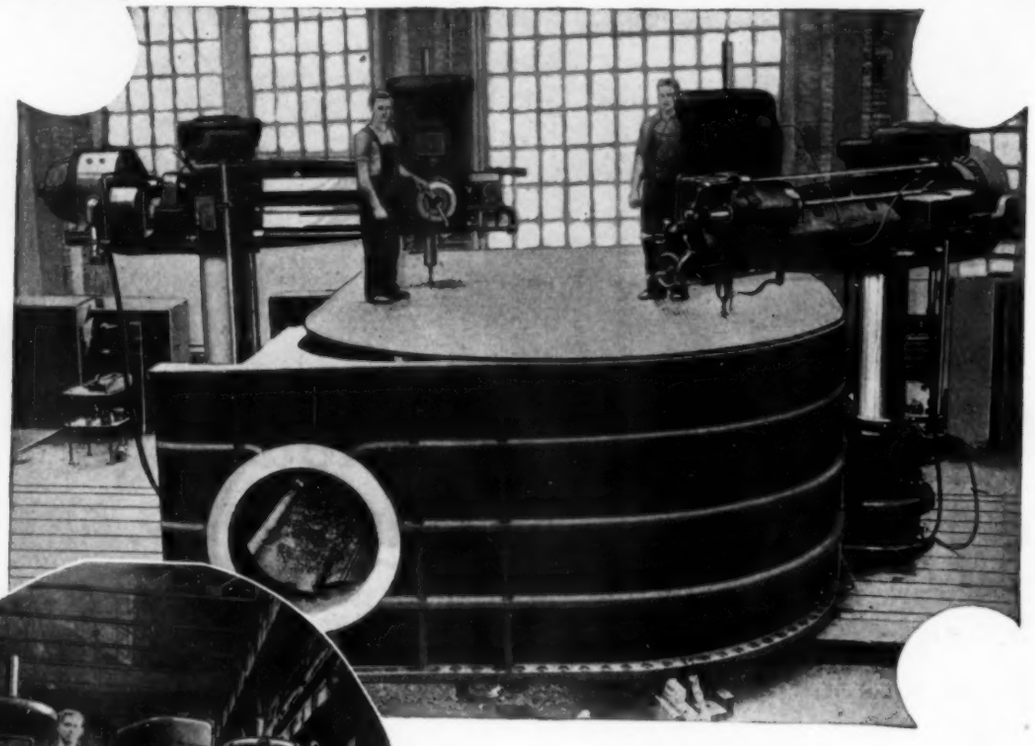
Hartness Screw Thread Comparator

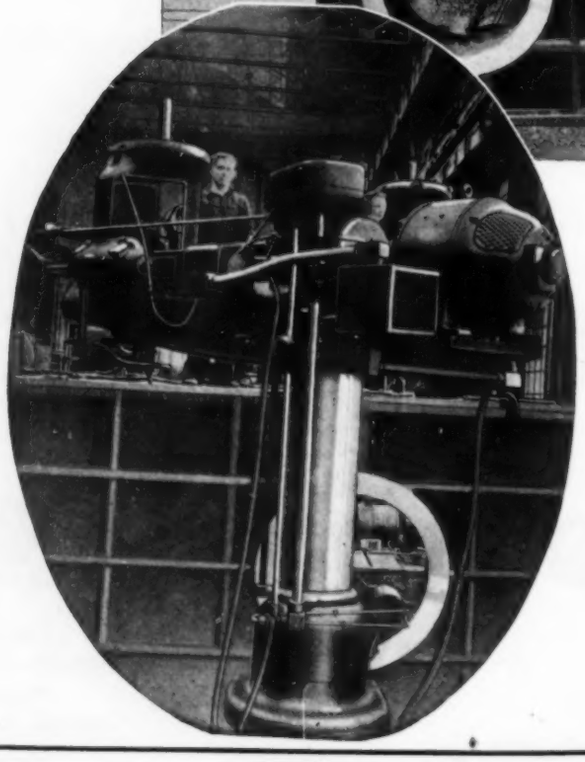
AND AGENTS:

GERMANY, M. Koyemann, m, b, H. Dusseldorf
JAPAN, KOREA, MANCHURIA, FORMOSA, Mitsui Co., Ltd., Tokio
FRANCE, SPAIN and BELGIUM, C. E. Carpenter Co., 57 Rue Richelieu, Paris, France
AUSTRALIA, McPherson, Pty., Ltd., 554 Collins St., Melbourne

12 in. to 48 in. Swing

16 in. to





Lathes Shapers
Radials

CINCINNATI
MAKES MORE MACHINE TOOLS IN LARGER VARIETY THAN ANY OTHER CITY IN THE WORLD
TO SEE ANY UP TO DATE MACHINE TOOL COME TO
CINCINNATI

The American Tool Works

28 in. Stroke **2 ft. to 10 ft. Arms**

Three prime factors

SPEED, range and power are the three dividend payers found in **American Triple Purpose Radials,** and you get their full benefits without waste of operating time.

The American 6-ft. Radial will drive an 8-in. pipe tap with the same ease as it runs in a 1-in. drill.

All driving gears except the large internal gear are chrome manganese steel heat treated and hardened. All bearings bronze bushed. All important bearings oiled from central stations by filtered oil. All mechanism fully enclosed in dust-proof housings and protected by automatic fool-proof features.

Opposite, we show an **American Triple Purpose Radial** installation in the Allis-Chalmers plant. Any 6-ft. radial drill would drill the 24,656 holes in this condenser shell *but* the Allis-Chalmers officers have put **"Americans"** on the job *because* they *know* from experience that the **"Americans"** will drill those 24,656 holes better, faster and cheaper.

If drilling holes at a profit is of any interest to you we can show you how it can be done.

Do it on an

AMERICAN

Triple Purpose Radial

Why hamper your skilled men with obsolete equipment?

Company, Cincinnati, U. S. A.

Use High-speed Gear Shapers in 1926

——and——

Earn Greater Profits

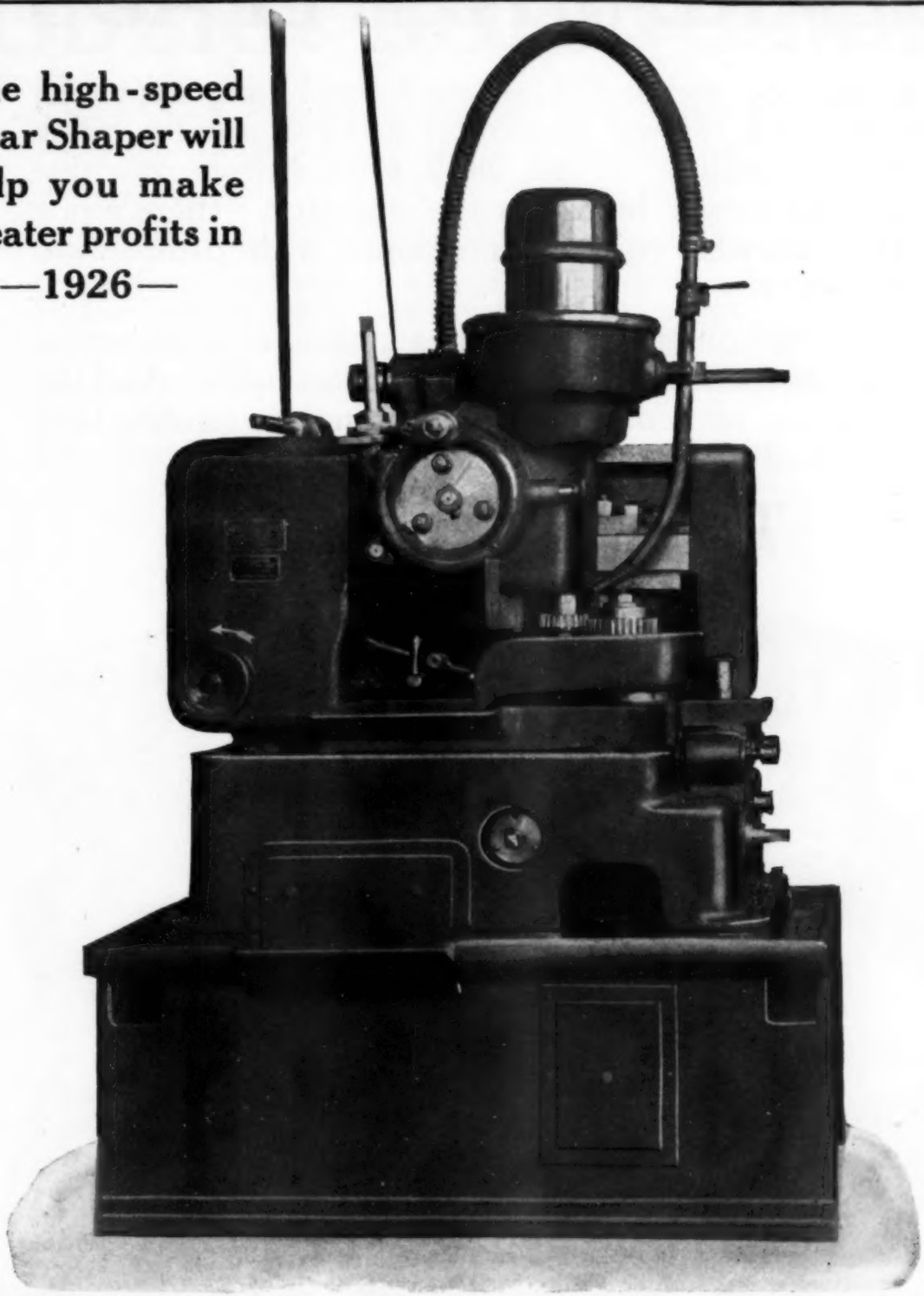
Start the new year right by looking carefully into your plant equipment. Obsolete equipment should be replaced with the very latest tools you can get.

Modern equipment will reduce your costs and enable you to earn a greater profit. You will also be in the position to meet competition and lower prices.

The gear cutting departments of many manufacturers earned greater profits in 1925, because they were equipped with High-speed Gear Shapers.

Plan on Using
High-speed Gear Shapers
in 1926

The high-speed Gear Shaper will help you make greater profits in —1926—



THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: Springfield, Vermont, U. S. A.

Branch Office: 651 Book Bldg., Detroit, Mich.

FOREIGN AGENTS: Alfred Herbert, Coventry, England—Great Britain; Alfred Herbert (India), Ltd., Calcutta and Bombay—India; Alfred Herbert, Ltd., Osaka and Tokio—Japan and China; Alfred Herbert (Australasia), Ltd., Sydney—Australia; Societe Anonyme Alfred Herbert, Paris—France and Spain; Societa Anonima Italiana Alfred Herbert, Milan—Italy; Societe Anonyme Belge Alfred Herbert, Brussels—Belgium and Holland; Bohm & Borman, Berlin—Germany, Czecho-Slovakia and Austria; Aktiebolaget A. Bonthrom, Stockholm—Sweden, Finland and Norway; American Machinery Import Co., Zurich—Switzerland.

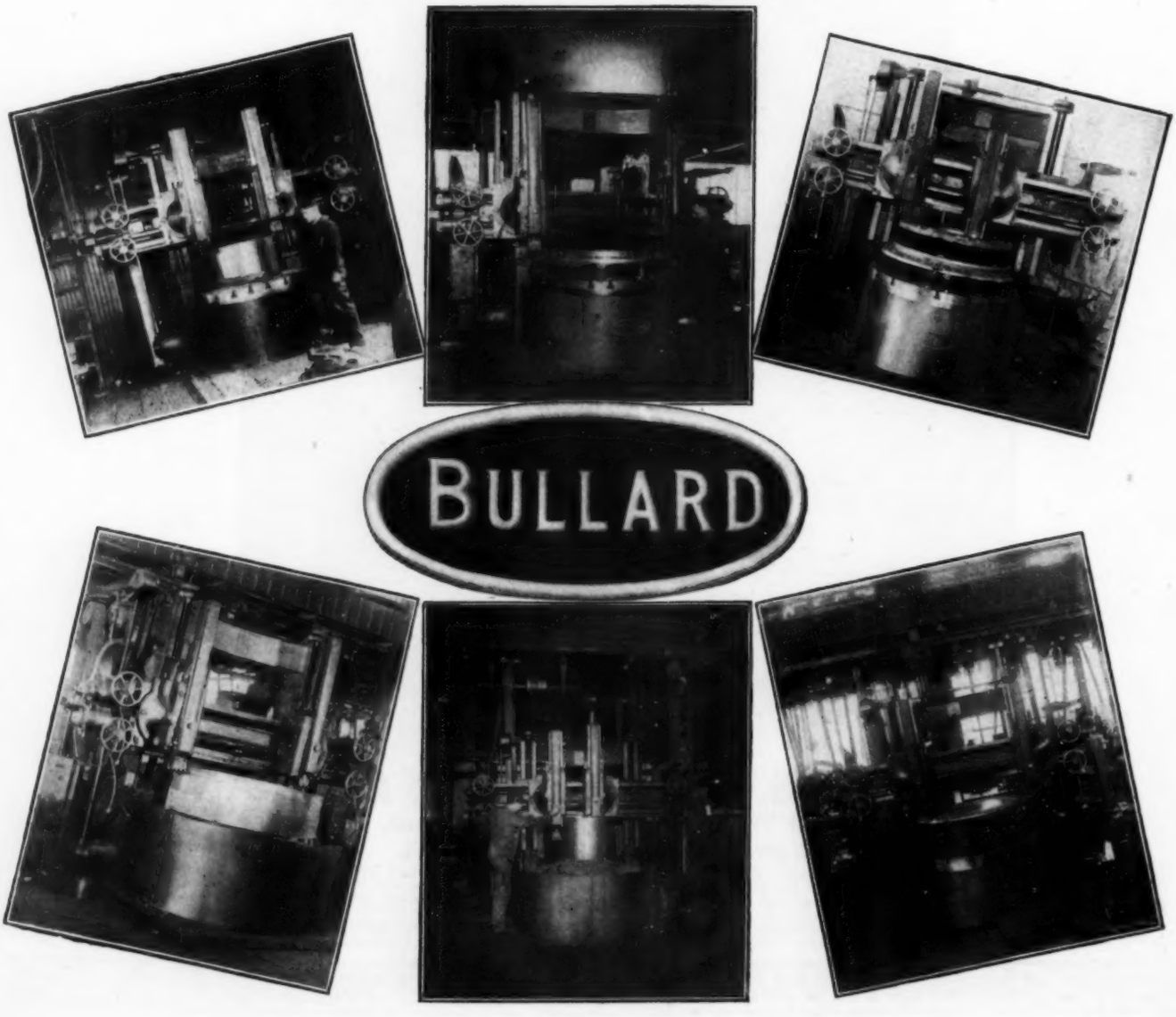
PACIFIC COAST REPRESENTATIVES: Louis G. Henes, 75 Fremont St., San Francisco, 218 E. Third St., Los Angeles.

BULLARD STILL LEADS IN

When the job requires it,—heavy machining up to 64 in. swing, sturdy tool support, excessive power, quick and easy handling of the work with simple machine control and power helps for the operator,—there's one tool that answers your requirements with production and economy.

The Maxi-Mill offers extra features in design, construction and operation without proportional extra price. And the extra margin of economy keeps piling up profits long after the tool has paid for itself.

THE MAXI-MILL



MODERN BORING MILLS

There are high grade materials, laboratory controlled and carefully selected for their particular service, used in construction.

Single Pulley drive with unit power and speed control handy to the operator.

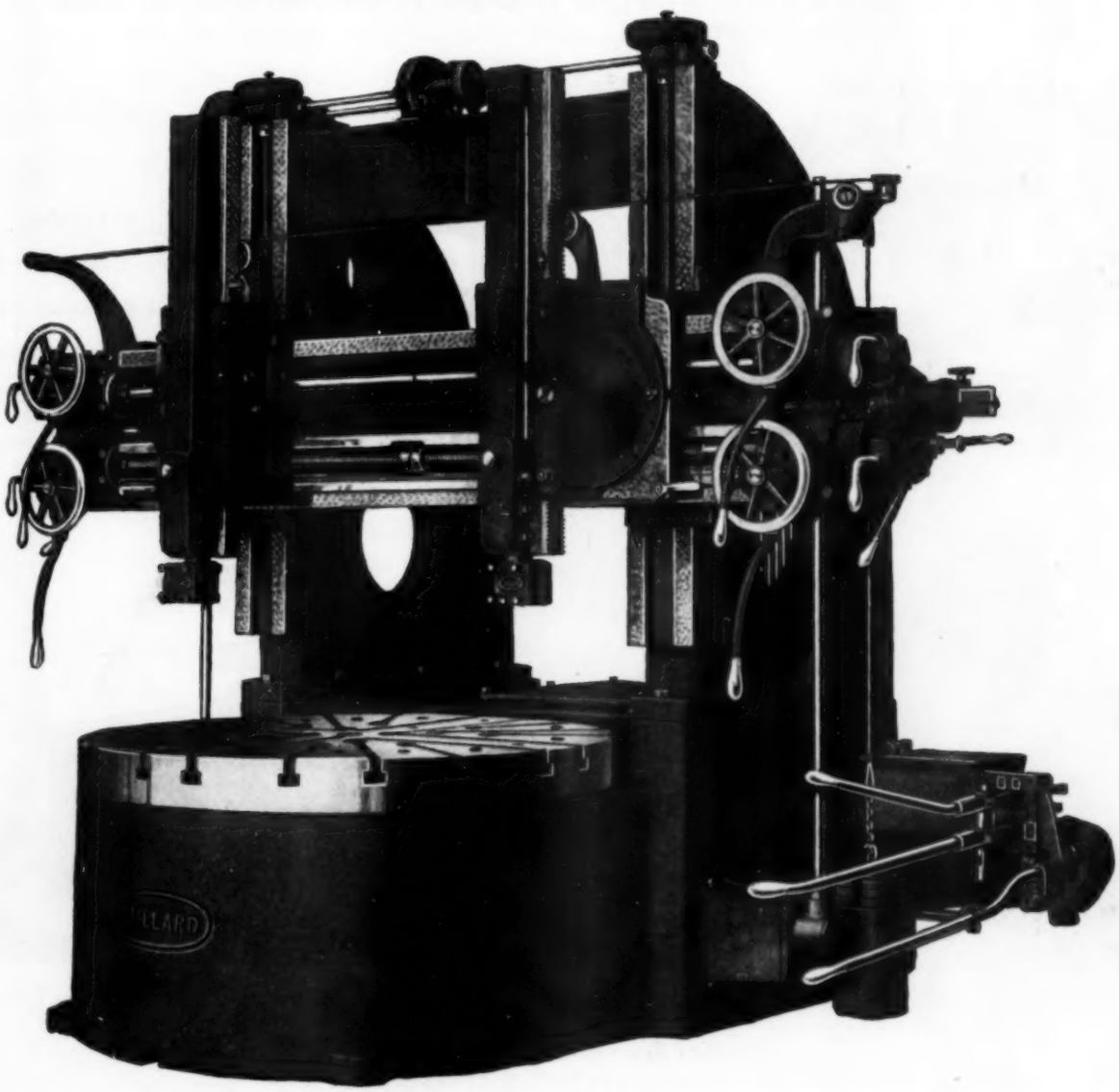
Quick change feed adjustment, wide range, positive, independent for each head with power rapid traverse to save time and energy.

Plus Continuous flow lubrication, broad bearings with adjustment by tapered gibs, graduated scales and micrometer dials, extension levers for heavy hand feed.

It's a modern mill measured by the latest shop requirements.

Built In

BRIDGEPORT, CONNECTICUT



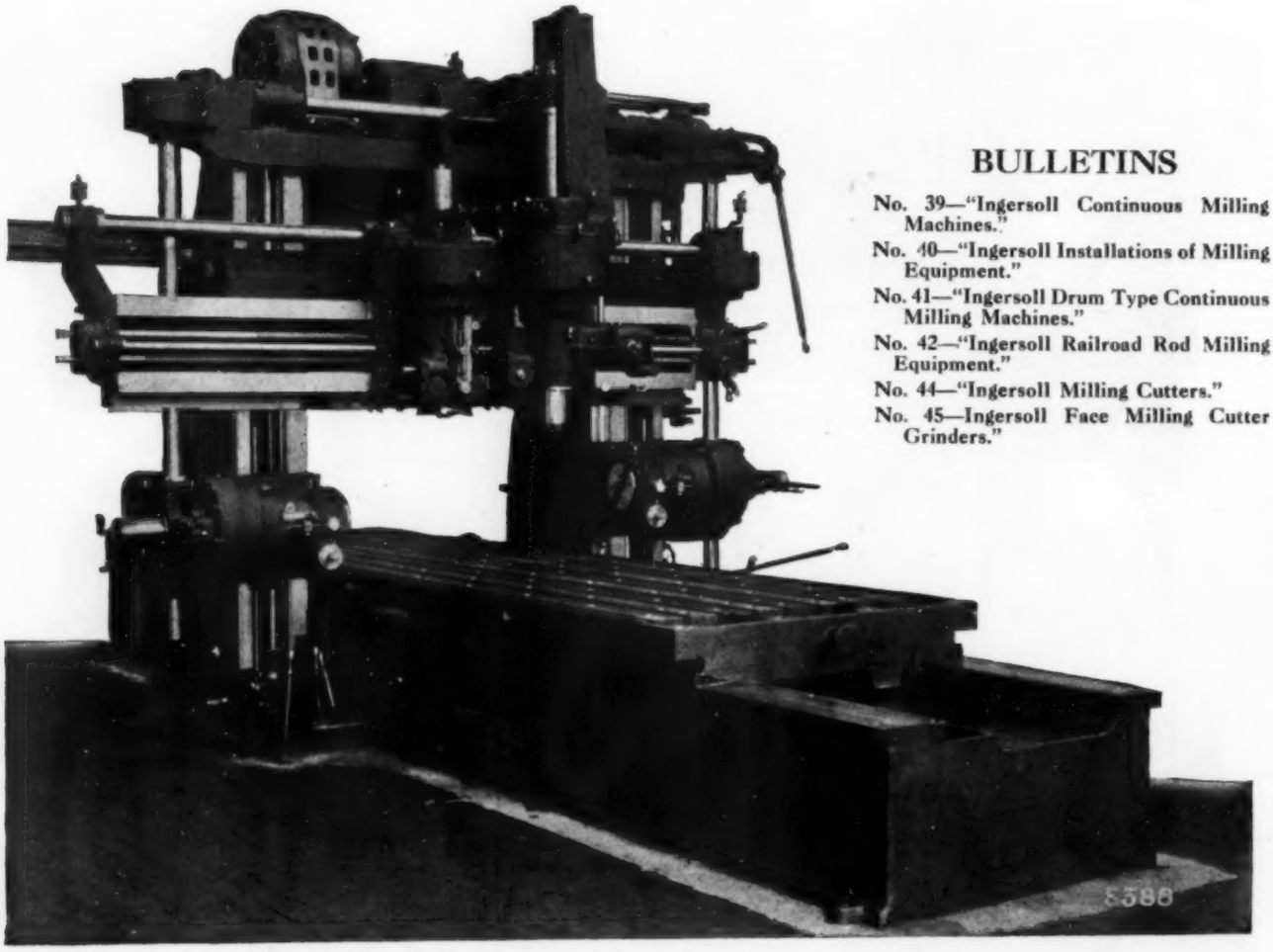
INGERSOLL

WE WISH YOU A HAPPY AND PROSPEROUS NEW YEAR

WE take this opportunity to thank our customers for the business they have given us during the past year. We fully appreciate the confidence they have shown in us and will exert ourselves to the utmost to merit a continuation of this confidence in the future.

The machine illustrated below is one of the latest and most modern of the Ingersoll Planer Type Milling Machines. This design was developed during 1925, and we confidently expect that the year 1926 will see many of them installed in progressive shops throughout the country.

We invite inspection of our plant and will be glad to demonstrate the possibilities of Ingersoll Machines on your castings. In any case, write for copies of the bulletins listed below.



BULLETINS

No. 39—"Ingersoll Continuous Milling Machines."
No. 40—"Ingersoll Installations of Milling Equipment."
No. 41—"Ingersoll Drum Type Continuous Milling Machines."
No. 42—"Ingersoll Railroad Rod Milling Equipment."
No. 44—"Ingersoll Milling Cutters."
No. 45—Ingersoll Face Milling Cutter Grinders."

THE INGERSOLL MILLING MACHINE CO.
Milling Machines and Their Equipment
ROCKFORD, ILLINOIS

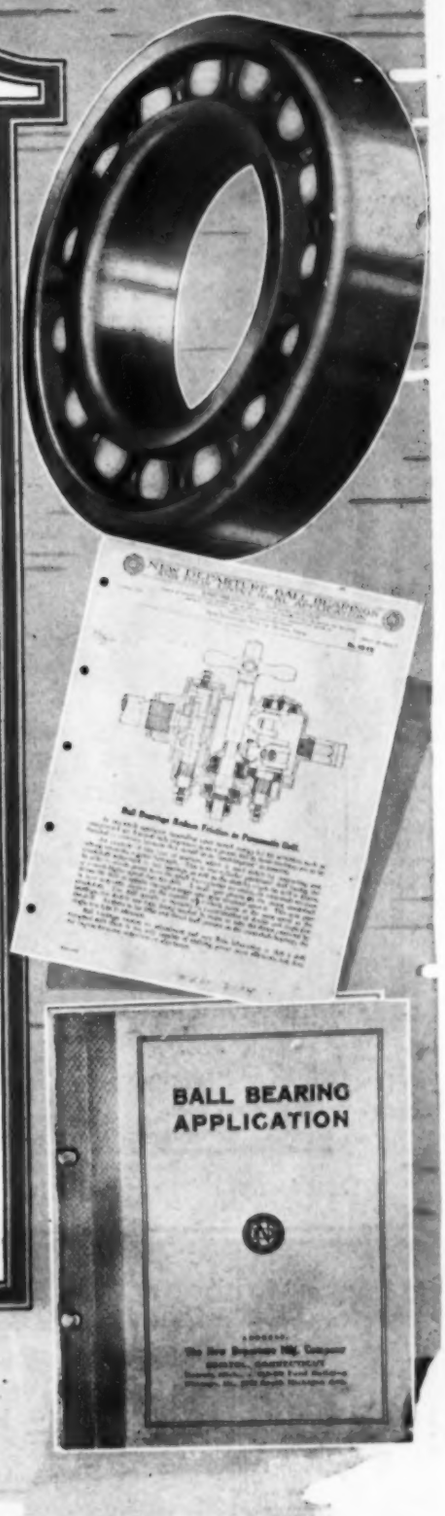
New Departure Ball Bearings

A 210-Page Book FREE

This New Departure Engineering Handbook sticks close to its subject: ball bearing application—and yet the subject is so closely allied to various phases of machine design that engineers find it helpful in interrelated problems as well.

Ball bearings are an inevitable development in almost every field. Hence the value of this work to every forward-looking engineer and designer.

Furnished in loose-leaf form with binder — also new sheets issued monthly to add to or keep up with various trends, the data already compiled. Mailed without cost or obligation to all whose letterheads show it can be used to advantage.



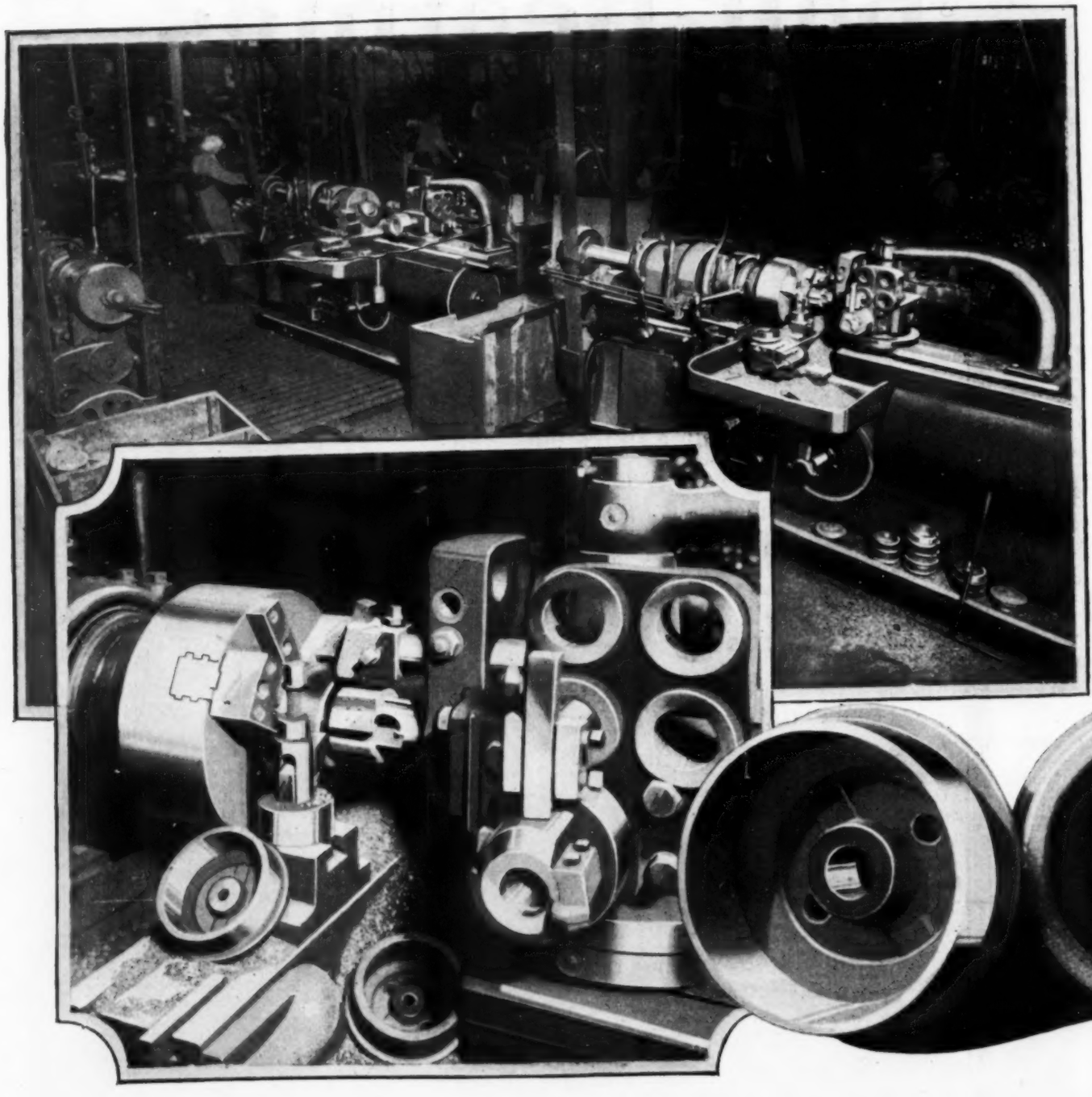
THE NEW DEPARTURE
MANUFACTURING COMPANY

Detroit *Bristol, Connecticut* Chicago

276

265

Speeded up production!—Saved



us money!—Good Machines!!!

These comments, telegraphic in brevity, voiced in the person of Mr. C. Brown, Supt. of Machine Shops, what the Paige-Detroit Motor Car Co. think about P & J Automatics.

In this busy automotive shop and in practically every other motor car manufacture for that matter, these staunch producers are daily demonstrating that P & J versatility and flexibility go hand in hand with high output.

Easily switched from one job to another, they combine a "production reserve" invaluable in this highly competitive business, and indispensable in machining the hundreds of widely varying parts that go in the making of a modern automobile.

Not forgetting, of course, that low unit costs are always guaranteed to be at the very minimum because the direct labor cost is split over four machines.

The photographs on the opposite page show a group of eighteen P & J's working in clock-like precision, delivering tote box after box of parts finished to close interchangeable limits.

The cast iron water pump bracket is drilled and rough turned, rough face front face, bore and turn 3 in. diameter and finish turn front face, line-reamed *at the rate of one in six minutes.*

Typical Automotive parts set-up

Job: Cast Iron Pump Bracket.
Operations: Drill and rough turn 3 in. dia.
Rough Face Front Face.
Bore and Turn 3 in. diameter and finish turn front face.
Line Ream Holes.
One man attends four machines.

Assuming that production men are primarily interested in their own problems, we cordially extend an open invitation to submit parts as a practical means of learning just what P & J economies mean, so we say again:

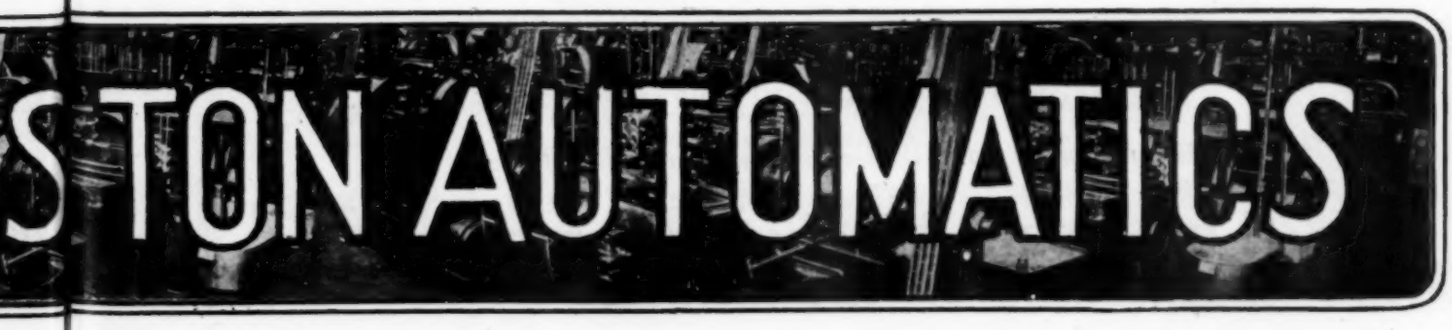
Send us your prints!

POTTER & JOHNSTON

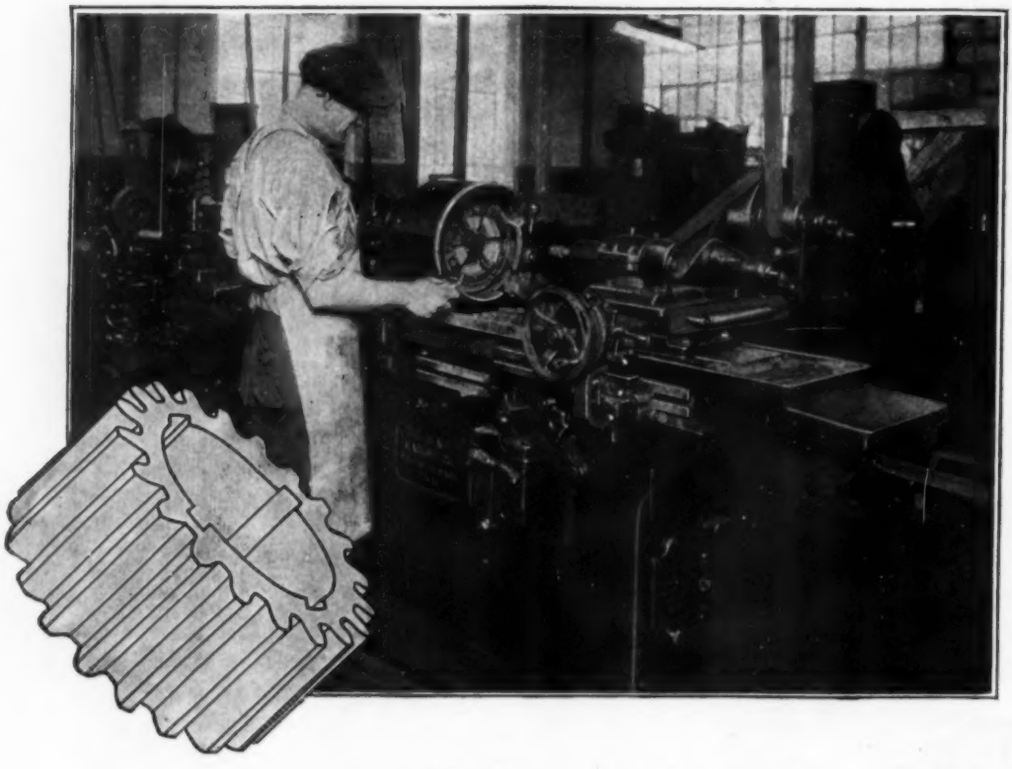
PAWTUCKET, R. I., U. S. A.

DOMESTIC OFFICES: New York Office: 270 Madison Ave., Frank H. Robinson, Manager. Detroit Office: The Potter & Johnston Agency Co., 535 Bates St. Chicago Office: 3057 Eastwood Ave., Leslie J. Orr, Manager. Pacific Coast Offices: Louis G. Henes, 218 E. Third Street, Los Angeles, California. Louis G. Henes, 75 Tremont Street, San Francisco, California. **CANADIAN REPRESENTATIVE:** Arthur Jackson, 32 Glenholme Ave., Toronto, Canada.

FOREIGN REPRESENTATIVES: L. J. Colomb, 68 Avenue de la Grande Armee, Paris, France. Representative for France, Belgium, Switzerland, Spain and Portugal. Charles Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nuova, 43 Milan, Italy. Rylander & Asplund, Stockholm, Sweden. Yamatake Company, No. 1 Yurakucho, Ichome, Kojimachiku, Tokyo, Japan.



90 per hour Month after Month



1826 ONE HUNDRED HEALD YEARS OLD 1926

WE are backing up last week's advertisement with another installation where production figures are best on long runs, the only satisfactory way of getting ultimate results. Here the machine is grinding gears, but whether it is gears, ball races, pneumatic cylinders or what not, the story is always the same, a continuous maximum production.

Furthermore, we have a machine for just your particular conditions, Standard for miscellaneous work, Semi Automatic for average size lots where limits are close and scrap must be kept down, or the Full Automatic, a mass production tool.

Remember tools and not labor are the dividend payers of today and the first to install are the first to get the lion's share of dividends.

Send us blueprints and samples and get our estimate.

Heald Hydraulics
Internals
Standard
Semi Automatic
Full Automatic
Size Matic

THERE'S A HEALD TO MEET YOUR NEEDS

Why hamper your skilled men with obsolete tools?

The Heald Machine Company

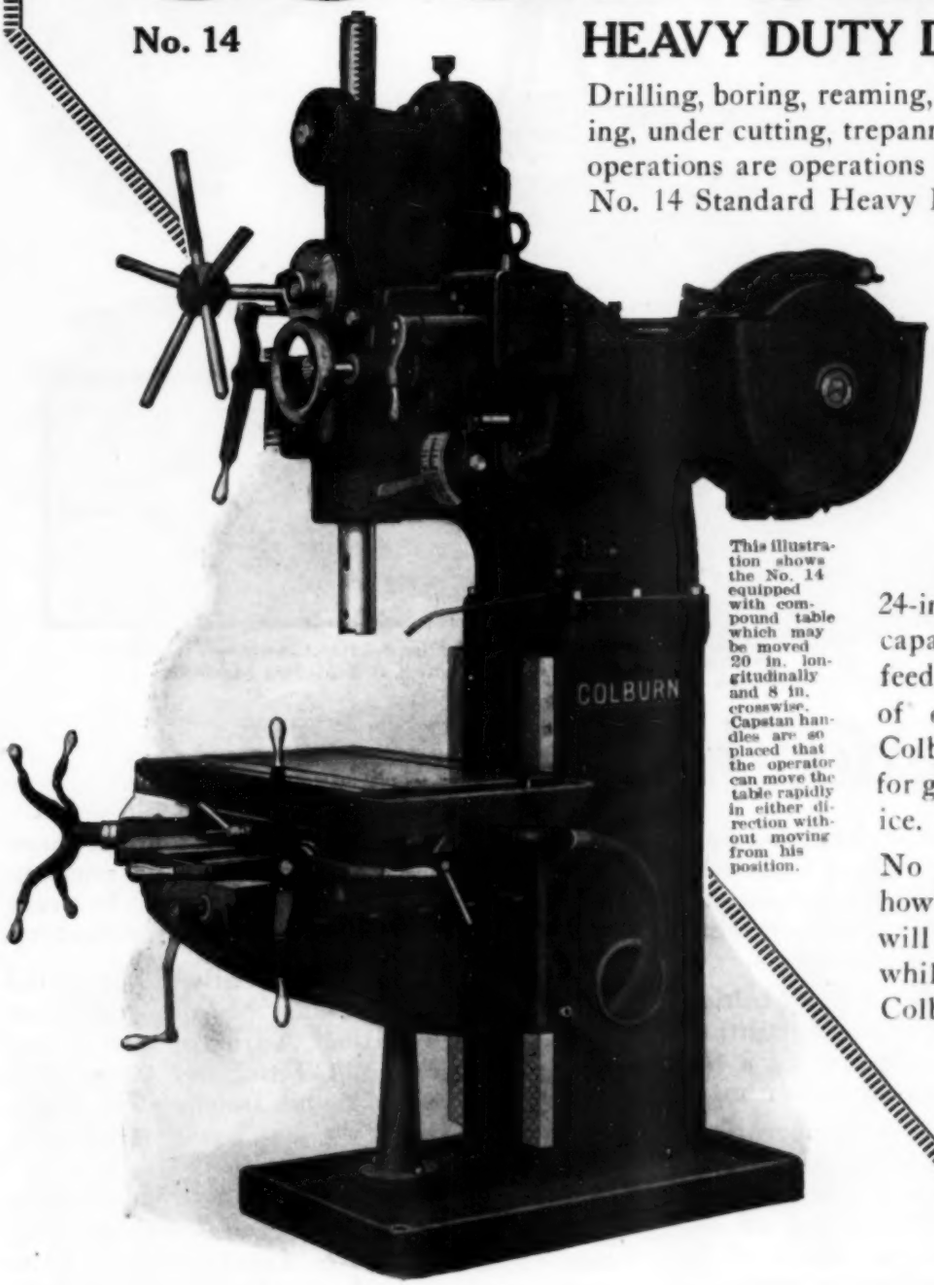
1826 **35 New Bond St., Worcester, Mass.** 1926

COLBURN

No. 14

HEAVY DUTY DRILL PRESS

Drilling, boring, reaming, tapping, hollow milling, under cutting, trepanning and other similar operations are operations that the COLBURN No. 14 Standard Heavy Duty Drill Press will handle with equal facility.



This illustration shows the No. 14 equipped with compound table which may be moved 20 in. longitudinally and 8 in. crosswise. Capstan handles are so placed that the operator can move the table rapidly in either direction without moving from his position.

This machine has a clearly defined purpose—it is built expressly to handle a large variety of work—quantity production today—special work tomorrow. Its 24-inch swing, 2 inch drill capacity, ample range of feeds and speeds, its ease of operation makes the Colburn an ideal machine for general all around service.

No matter how large or how small your shop—you will find it well worth your while to install at least one Colburn No. 14.

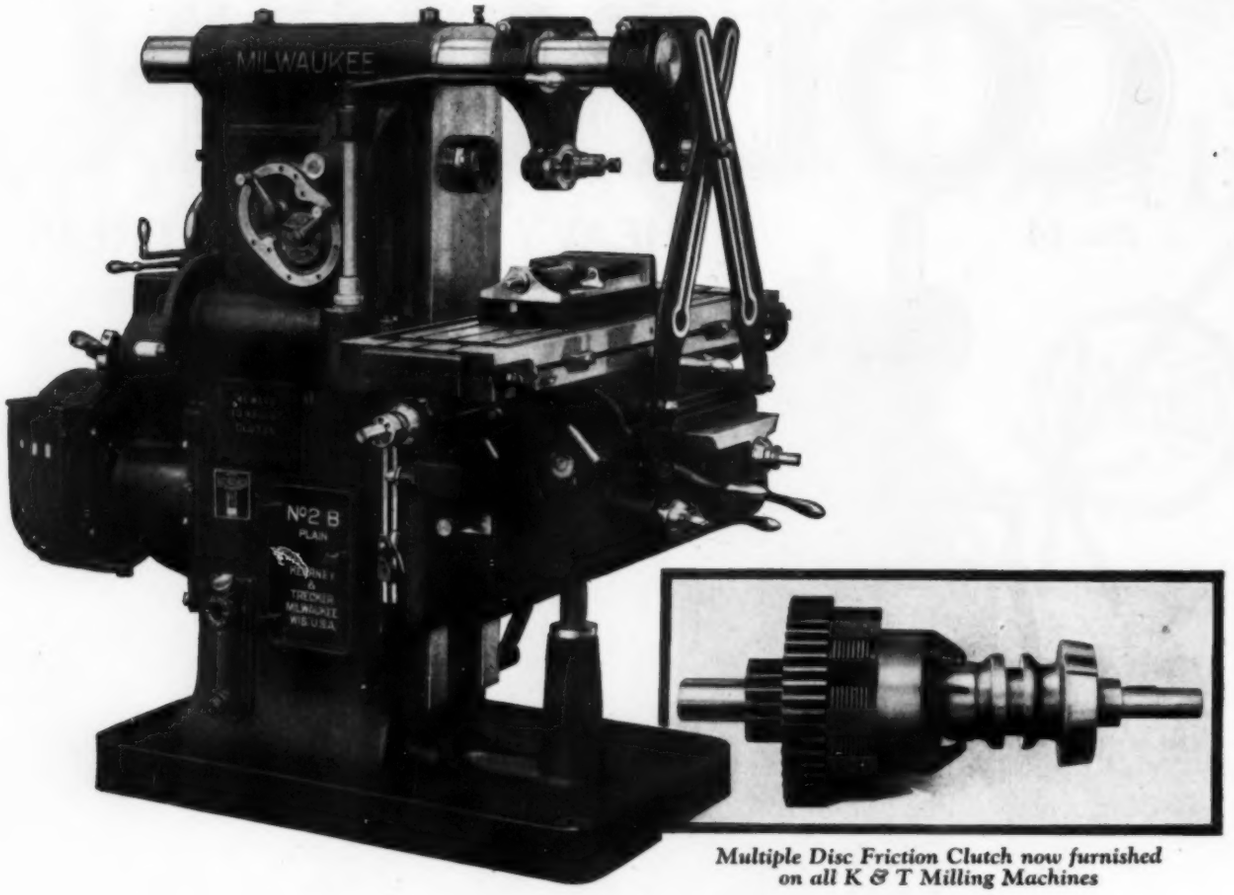
Let us send you a copy of Bulletin No. C. D. 109.

CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA
GENERAL OFFICE: ROCHESTER, N. Y.

BETTS Rochester **COLBURN** Rochester **NEWTON** Rochester **MODERN** Erie, Pa. **HILLES & JONES** Wilmington, Del.

CONSOLIDATED MACHINE TOOLS

If · It · Can · Be · Milled — Mill · It · Faster!



Multiple Disc Friction Clutch now furnished on all K & T Milling Machines

"Smooth as Velvet"

THAT is how one operator expressed satisfaction over the new friction clutch on his Kearney & Trecker Milling Machine. It's not a bad description either, for it certainly sums up the operation in a few words.

The new K & T clutch is of the Multiple Disc type. It is designed to work continuously under full load, and possesses a fine quality of smooth and positive operation.

The contact is metal to metal between phosphor bronze and hardened saw steel plates, running in oil. The plates are amply separated when disengaged, eliminating all tendency to drift. Opposite movement of the clutch lever engages a cone type brake for quickly stopping the spindle.

Exhaustive tests were carried on at the Kearney & Trecker factory before this particular clutch was finally adopted. It was subjected to all manner of abuse and far more severe service than would ever be encountered in actual milling operations. In every test, this clutch has proven most satisfactory.

Other new refinements recently incorporated in Kearney & Trecker Milling Machines include: *Convenient Adjustable Starting Lever, Power Rapid Traverse*, Centralized Oiling for Saddle*, and Independent Table Feed Control**.

* (On No. 2 Machines and larger)

Whatever your requirements—"heavy hogging", or "delicate precision"—there is a new style Kearney & Trecker Miller to fit your needs. And our Production Service Department will gladly assist you in the proper tooling.

KEARNEY & TRECKER CORPORATION
MILWAUKEE WISCONSIN

MILWAUKEE MILLING MACHINES

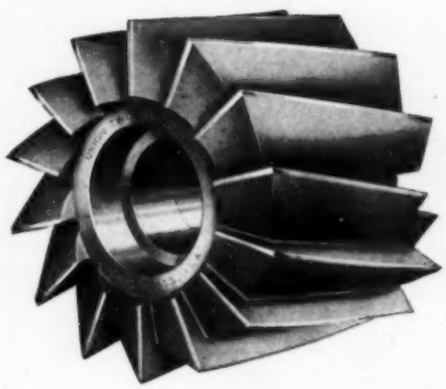
KEARNEY & TRECKER

How to side step high production costs

Competition makes cost cutting compulsory. Big savings can be made in tool costs by stocking Standard Cutters and Hobs.

We carry them in practically every style and they can be obtained without loss of time from us or our appointed agents throughout the country.

By standardizing on Union Cutters and Hobs you save the extra cost of special tools.



Ask for information about the line of Union Twist Drills —No. 60 and larger—that are ground *after* hardening.

Send for our late catalog and note the completeness of the Union Line.

—and start to standardize now.

All kinds of Special Cutters made to order

UNION TOOLS

Union Twist Drill Co., Athol, Mass.

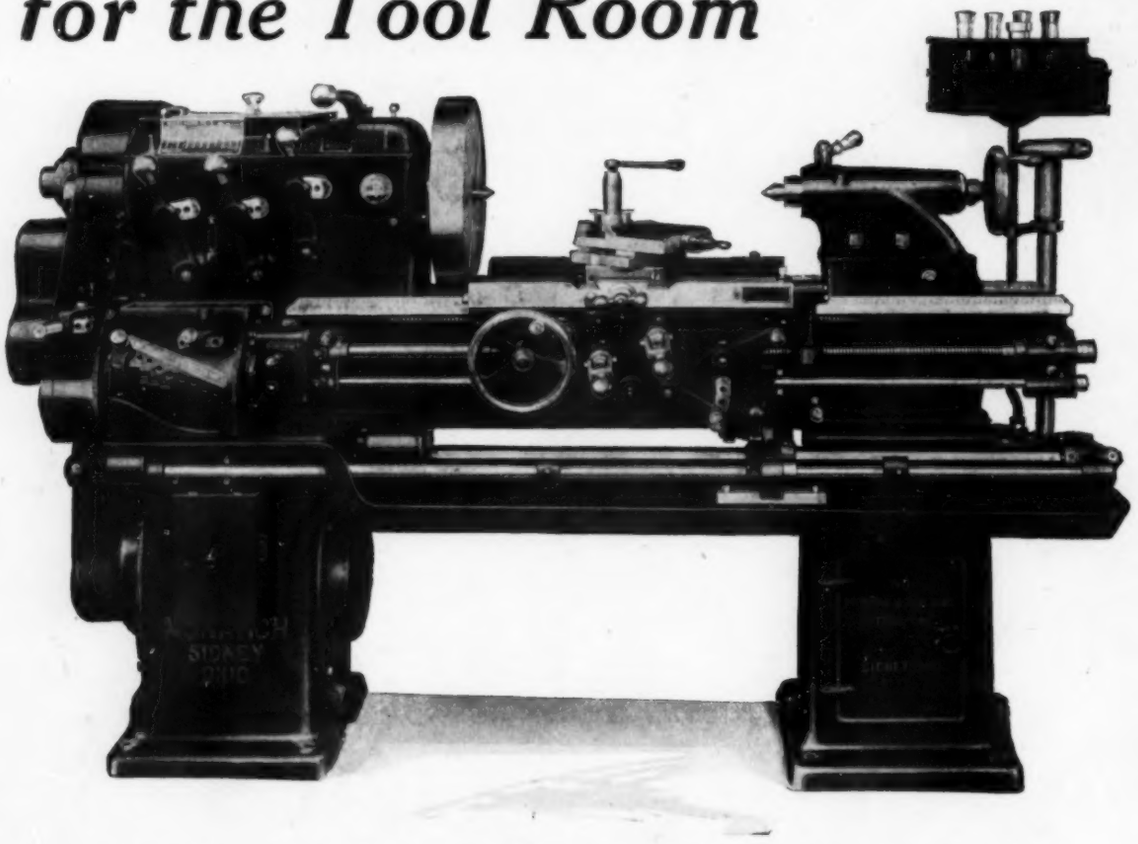
Chicago Store: 11 So. Clinton St. *Makers of* New York Store: 62 Reade St.

All Kinds of Cutters, Twist Drills, Reamers, Taps, Dies, etc.

AGENTS THROUGHOUT THE WORLD

MONARCH LATHES

for the Tool Room



16-in. x 6-ft. Monarch Helical Geared Ball Bearing Lathe with lead screw reverse operated by apron lever with automatic lead screw stops operating in both directions of carriage travel. Weight exclusive of motor or other accessories 2800 lbs.

MONARCH Tool Room Lathes are furnished in 14, 16, 18 and 20-in. sizes and with all features and attachments considered essential for precision tool work.

The Monarch Lead Screw Reverse operates by lever at right hand end of carriage and reverses lead screw without shock or jar at the fastest chasing speeds. Also equipped with automatic stops operating in both directions of carriage travel. The thread cutting range is from 3 to 184 threads and feeds from .002 in. to 120 in.

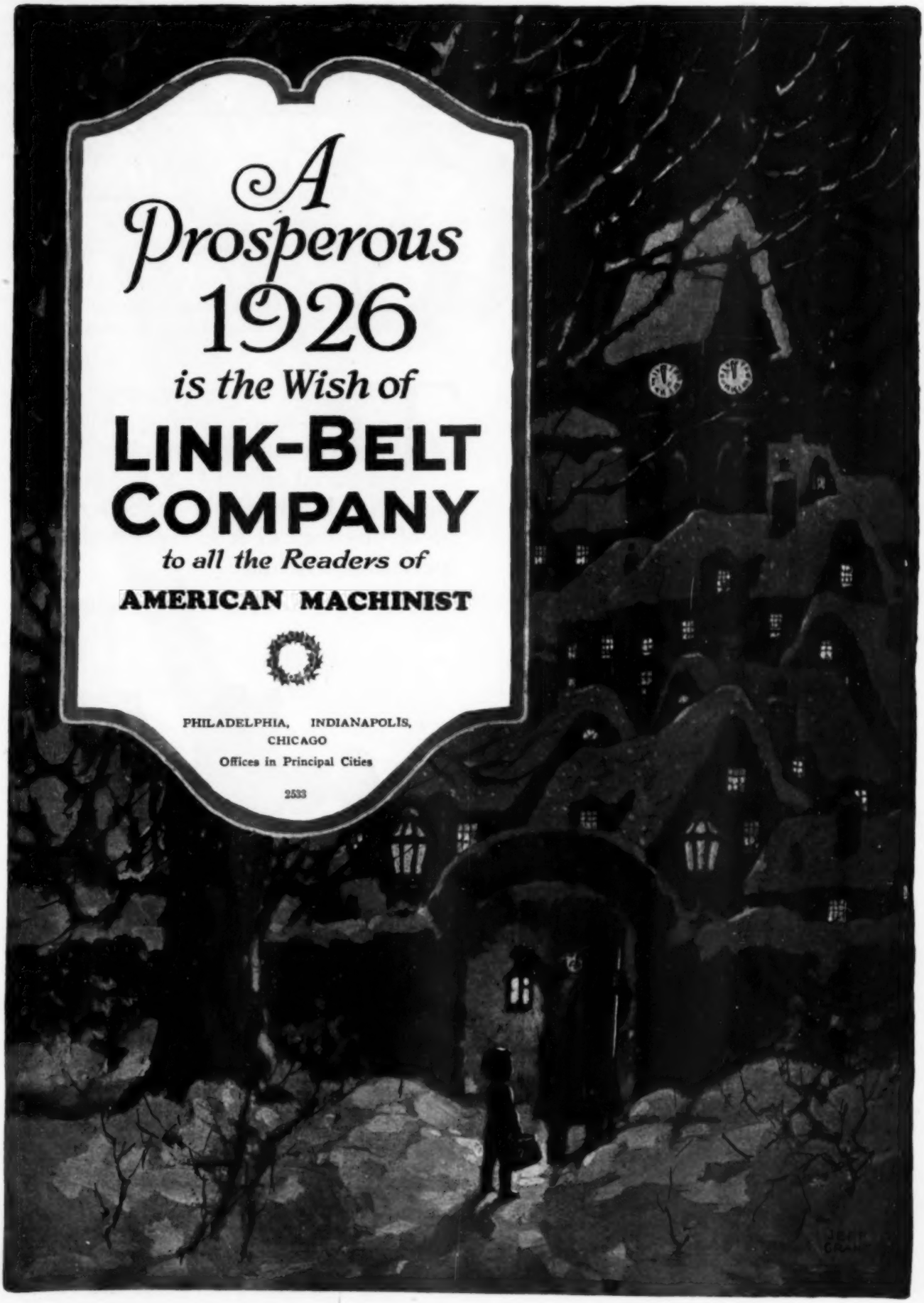
The Helical Geared Headstock with its 11 ball bearings transmits power silently and smoothly and absolutely will not transmit gear tooth marks to the work. All changes of spindle speeds made instantly. The Apron Feed Control Levers are a joy to operate; feeds are engaged and disengaged instantly, a feature most essential in working to close limits.

The Taper Attachment, Draw-In Collet Attachment, Universal Relieving Attachment, Micrometer Carriage Stop and other accessories are most convenient of operation and always please the operators. Motor is mounted inside the headstock leg and drive is by endless leather belt.

The accuracy of Monarch Tool Room Lathes is as perfect as it is possible to produce, and the accuracy will last because the design is perfect, the materials are the very finest, and workmanship beyond criticism. Toolmakers, even those with strongly pre-conceived ideas of toolroom lathes, welcome these new Monarch Lathes.

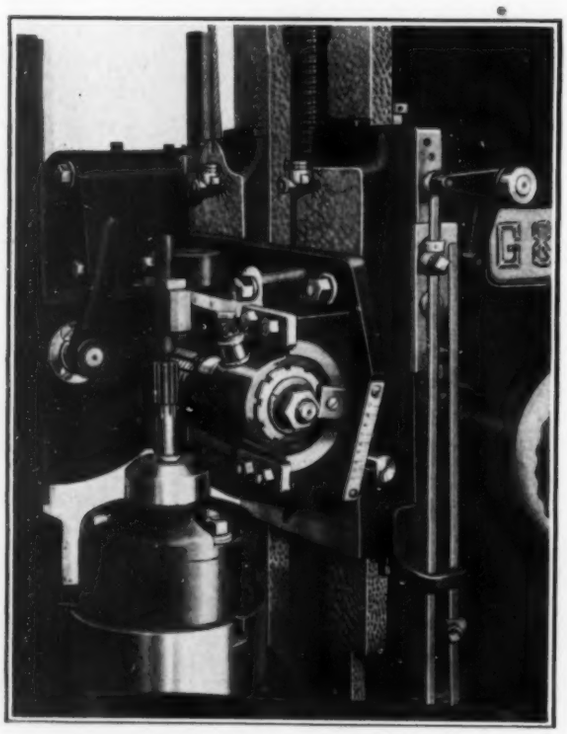
Bulletins will gladly be sent.

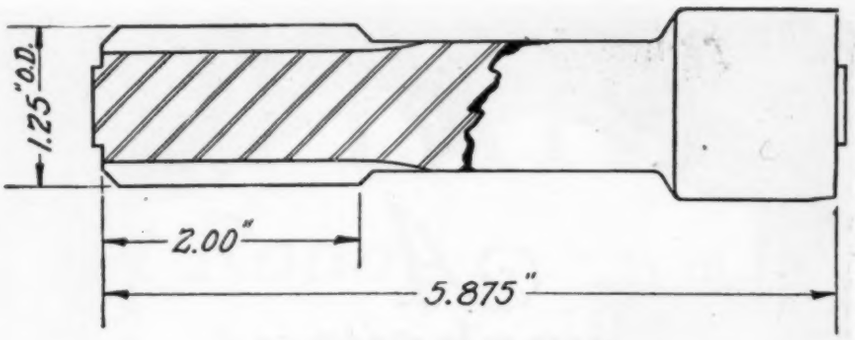
THE MONARCH MACHINE TOOL CO., Sidney, Ohio


A Prosperous 1926
is the Wish of
LINK-BELT COMPANY
to all the Readers of
AMERICAN MACHINIST
PHILADELPHIA, INDIANAPOLIS, CHICAGO
Offices in Principal Cities
2533

40 of these Splined Shafts per hour

More than double former production



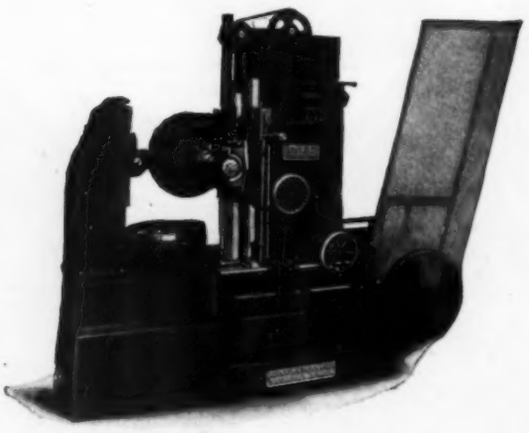


10 Teeth (Spline)

Stub Shaft: 10 teeth, spline. S.A.E. No. 1045 finished in one cut for grinding, 1 shaft per setting with single thread rough ground hob 4 in. in diameter.

THIS is but one example of spur-tooth cutting that is easily and economically produced on the G & E Manufacturing Hobber. It is concrete proof that the "G & E" is a flexible specialized machine.

Have you a similar job we can figure on?



GOULD & EBERHARDT

ESTABLISHED 1833

GEAR CUTTING MACHINES AND SHAPERS

NEWARK, N.J., U.S.A.

The Hobber With the Vertical Cutting Principle

Cutter Carriage Ways are always kept clean

After all is said and done

TODAY the curtain is drawn on the scenes of 1925. Results have either been good, ordinary or poor.

Equipment has been the governing factor in these results and the plants that have produced the greatest profits are the ones wherein the equipment is the most modern.

However, it's never too late to remedy faults. You'll soon be taking stock and during this process you can replace the wasters with tools of proven quality.

GTD Taps, Dies, Reamers, Drills and other Small Tools pay dividends because of their performance features.

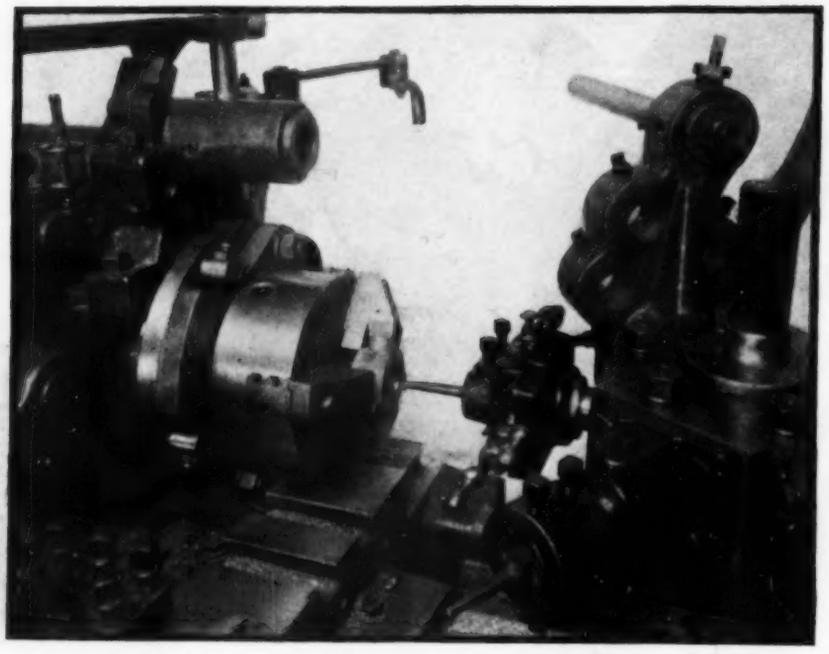
Stock them this coming year and note the profit curve rise.

A Happy and Prosperous New Year to you is our offering.

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

Chicago Store: 13 So. Clinton St. New York Store: 15 Warren St.
Canadian Plant: Greenfield Tap & Die Corporation of Canada, Limited, Galt, Ont.
London Office: Greenfield Tap & Die Corp., 139 Queen Victoria St., London, E. C. 4

GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Tools, Twist Drills, Screw Slotting Cutters



for big production—

THIS No. 4 Universal Turret Lathe increased the production of oil pumps from 4 to 8 per hour.

Each pump has two straight and one eccentric bores. The eccentric hole must be tangent to the larger bore at a definite point. The W & S eccentric indexing fixture eliminated one operation and gave the required accuracy. The piece is held in a standard three-jaw chuck held in the fixture, which keeps the cost down. The other tools are all standard.

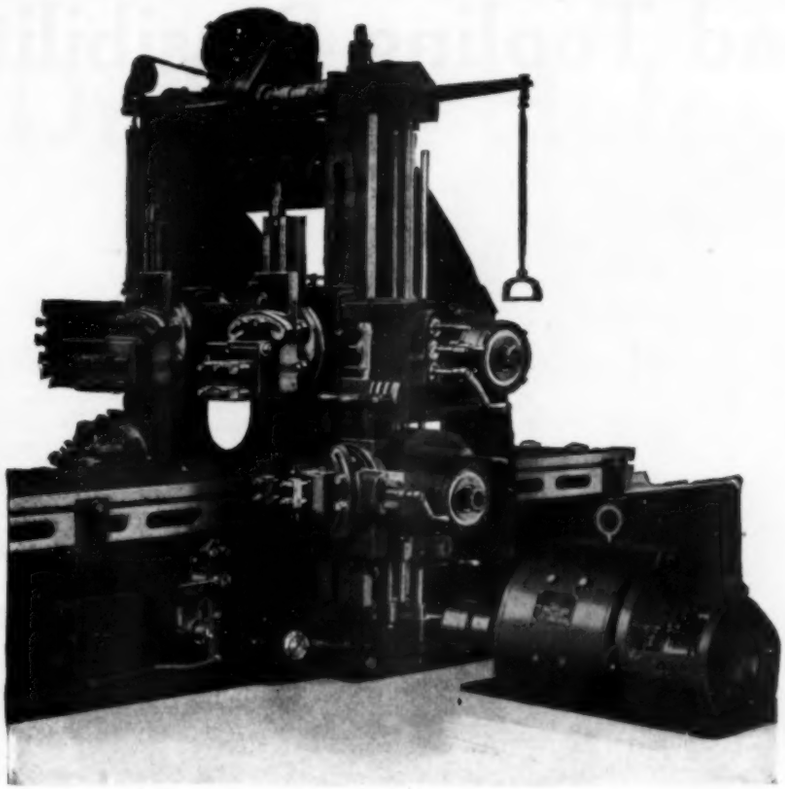
For 45 years W & S engineers have been solving the production turret lathe problems of American industry. The benefit of this valuable experience is yours, free of charge.

The Warner & Swasey Company

CLEVELAND, OHIO, U. S. A.

NEW YORK: Singer Building
BOSTON: Chamber of Commerce Building
BUFFALO: Iroquois Building
PITTSBURGH: Chamber of Commerce Building
PHILADELPHIA: 518 Springfield Ave., Upper Darby

DETROIT: 5028 Second Boulevard
CHICAGO: 618-622 Washington Boulevard
MILWAUKEE: 1143 Wells Building
DAYTON: 518 Mutual Home Building
LOS ANGELES: 228 Central Ave.



Simplicity of Operation

The most striking characteristic of

Gray Maximum Service Planers

The control is so simple and so natural that even an apprentice can handle the planer with absolute confidence.

Can you imagine anything simpler than shifting a single lever to set the head?

Anything simpler than turning a knob to get the desired feed?

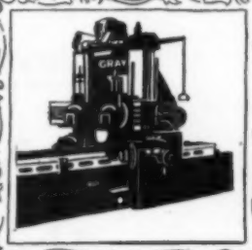
Anything simpler than turning one crank to clamp or unclamp the rail?

That's all you have to do on Gray Maximum Service Planers.

They are oiled automatically. Can anything be simpler?

And don't forget that they are fool-proof,—made so by Gray Safety Clutches. Let us tell you more about these remarkable machines.

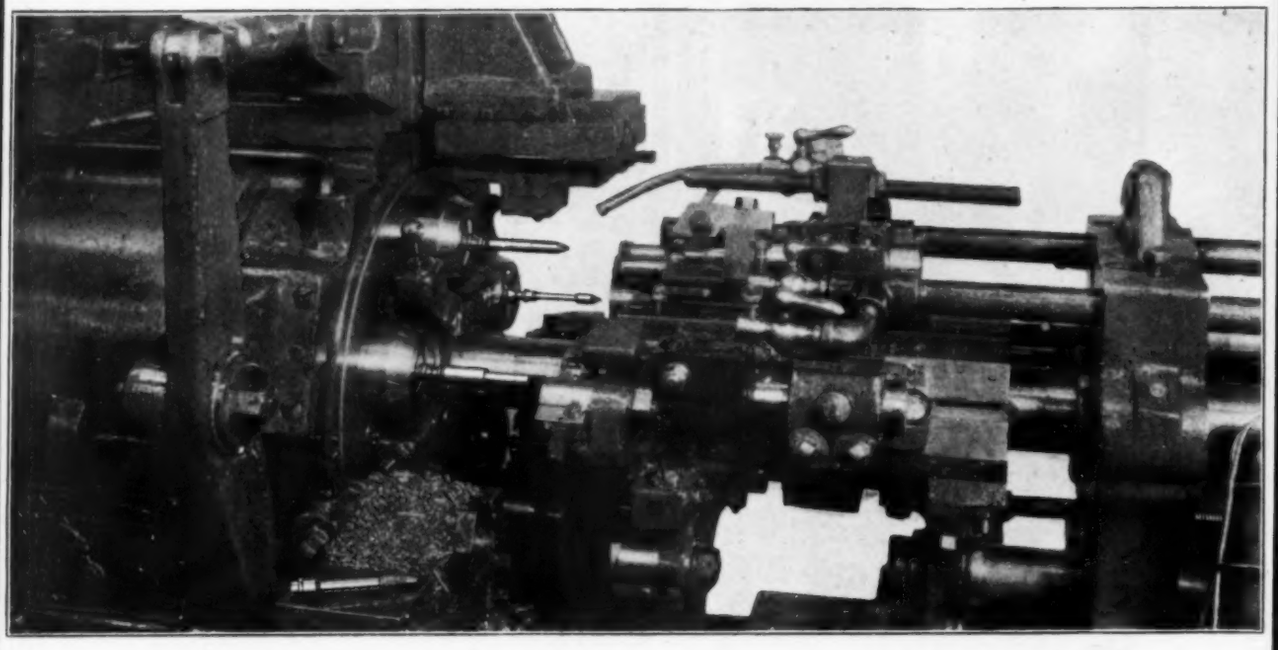
Our catalog is yours for the asking.



THE G. A. GRAY CO.

CINCINNATI, OHIO

Broad Tooling Possibilities



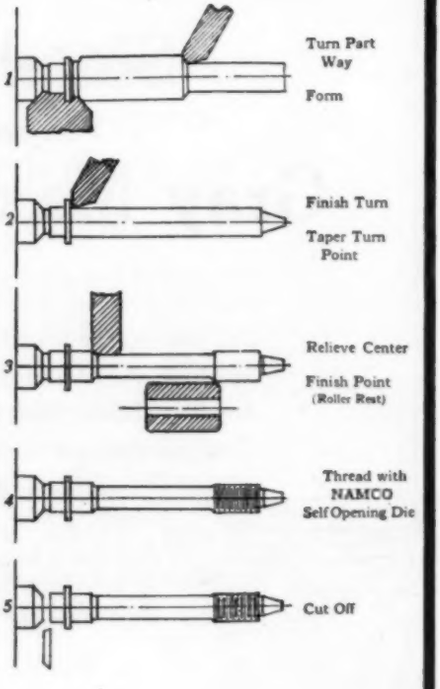
Perhaps you've heard of the remarkable speeds at which the Model C Five Spindle Acme Automatic Screw Machines operate, its extremely rapid turnover, the fast spindle speeds it has available.

But these are not the only reasons why the Five Spindle Acme can cut your production costs. Another big reason is that it offers broad tooling possibilities.

With five work spindles and the use of an oscillating stock stop, you can use both end and side working tools on each of the five spindles if necessary, thus allowing the performance of 8, 10 or more operations, the splitting of operations into parts, or the use of precise finishing tools to perform work that on many automatics must be done as a secondary operation on another type of machine.

Consider the tooling on the carburetor stem shown here for example. Notice how the turning is split up; see how the taper seat point is easily and accurately turned from the end slide; how the center is relieved by a tool fed vertically from the top slide and horizontally from the end slide.

ORDER OF OPERATIONS



Send B/P or Samples to find out the savings on your work.

The National Acme Company

Cleveland, Ohio

New York **Chicago** **Detroit**

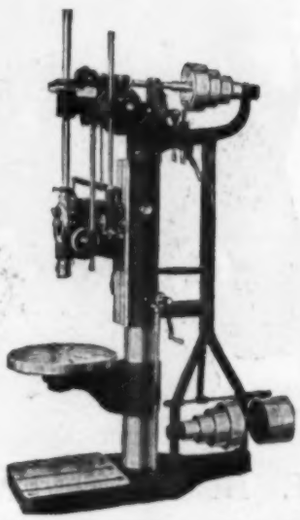
Makers of Threading Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio, and Gridley Multiple and Single Spindle Automatics and Gridley Chucking Machines at Windsor, Vermont.

Drilling Holes

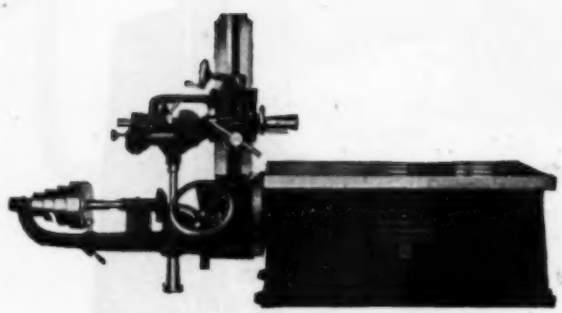
Quickly—Accurately

Stationary head, 8 inch to 25 inch

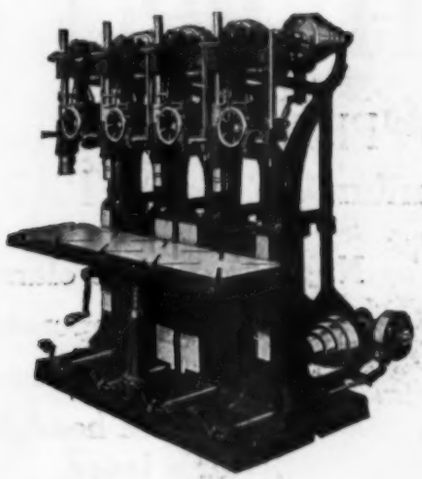
No matter what your drilling requirements, whether for light work or heavy duty, there is a Barnes Drill that exactly meets your needs. They are strong, reliable, accurate, compact, and simple. Lightning fast in operation, they bring the cost per hole on all drilling operations to a minimum figure. Barnes Drills are equipped with patented "Positive Self Feed," which increases drill press output to a maximum production.



Sliding Head, 22 inch to 50 inch



Horizontal Radials, 3 sizes



Gangs in any Combination

Established in 1872

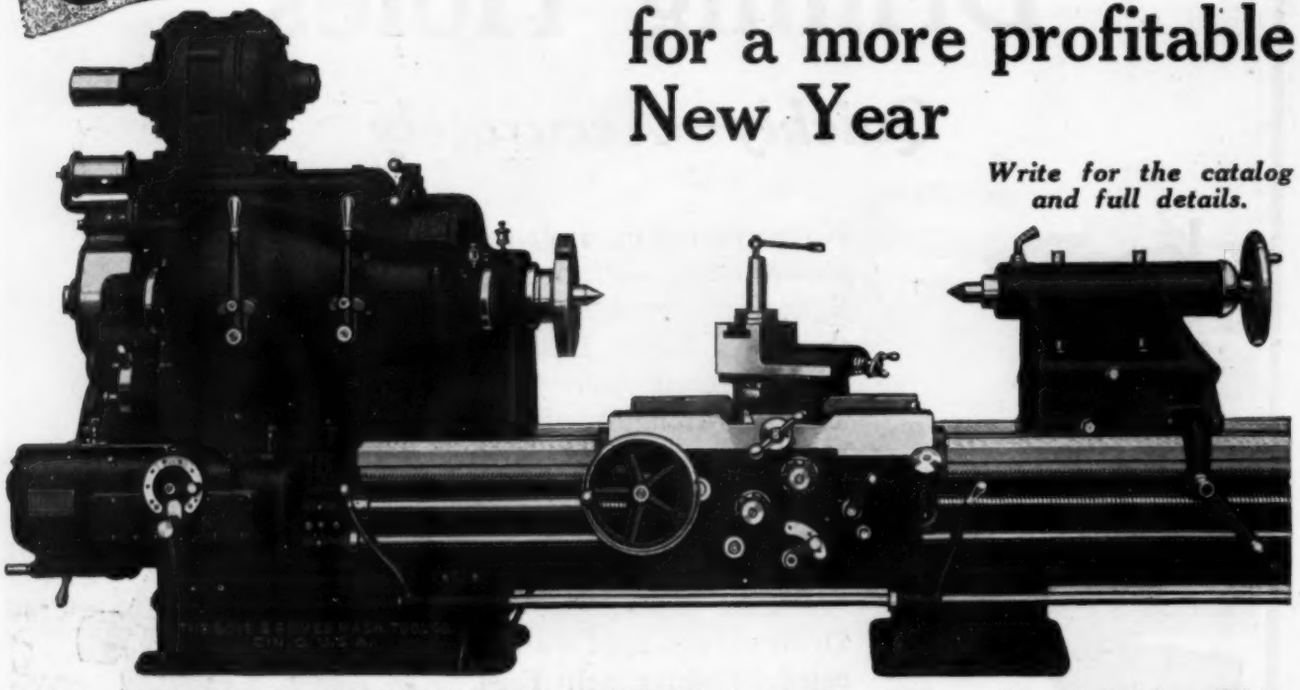
W. F. and John Barnes Co.

ROCKFORD, ILLINOIS

CONELESS

LATHES— for a more profitable New Year

Write for the catalog and full details.



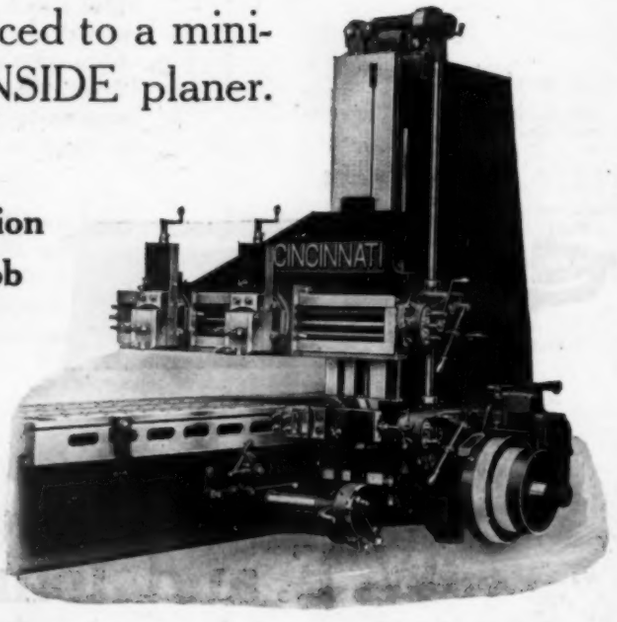
THE BOYE & EMMES MACHINE TOOL CO., Cincinnati, Ohio

HYPRO OPENSIDE

Planing cost has been reduced to a minimum on the HYPRO OPENSIDE planer.

No bolts used to clamp rail
Raise rail from operator's position
Set cutting feed by turn-off knob
Rapid traverse heads by shift of a lever
Oil only twice a week

Built in sizes 30 *in. to* 84 *in.*



THE CINCINNATI PLANER CO., Cincinnati, Ohio

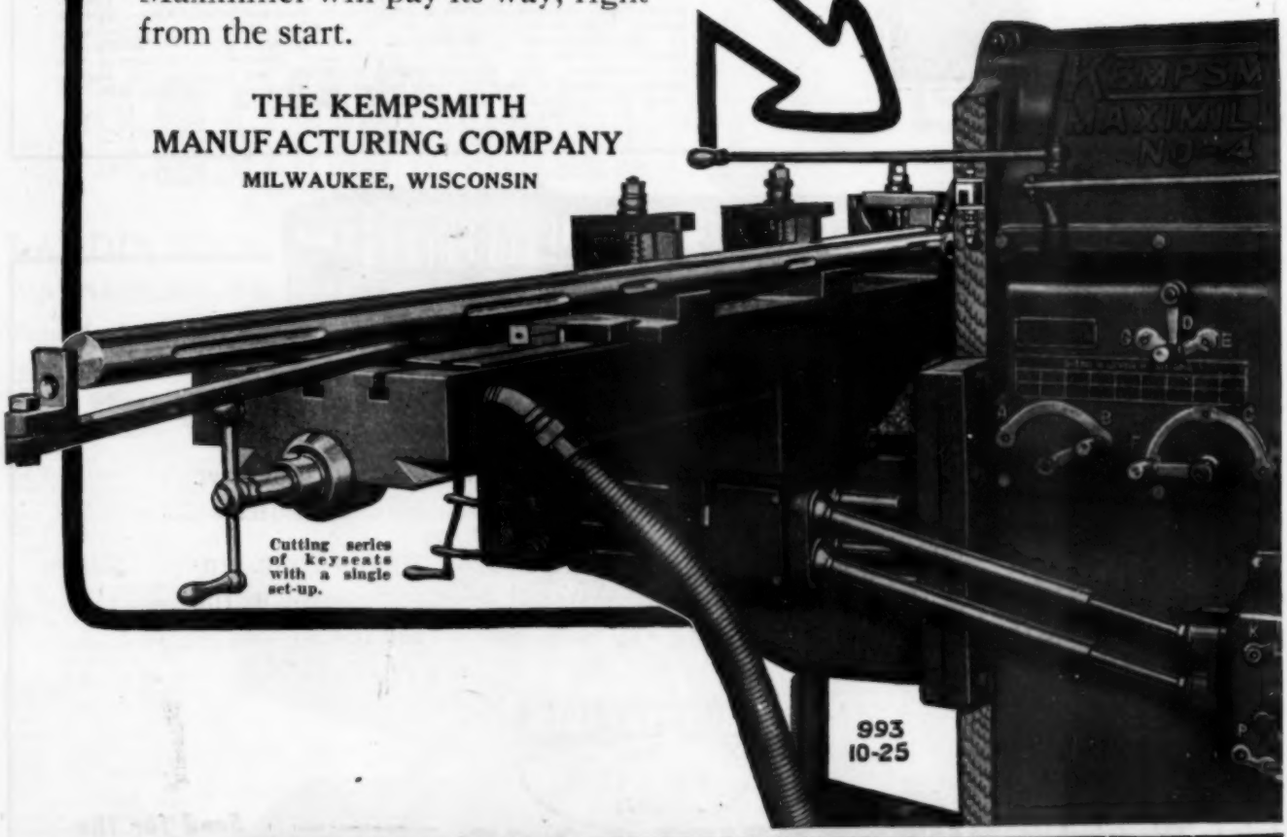
Kutting Kost of Key-Seats

A TYPICAL Maximiller saving. Time-cost is cut down on set-up, production and, later, in assembly. The cleanly cut, accurately aligned keyseats make key-fitting easy. Layout cost is minimized.

This triple saving is swiftly paying for the Maximiller. Soon it will be adding profits.

Somewhere — in *your* plant — a Maximiller should be cutting costs. Let us study your problems and make you a detailed estimate, showing you where and how the Maximiller will pay its way, right from the start.

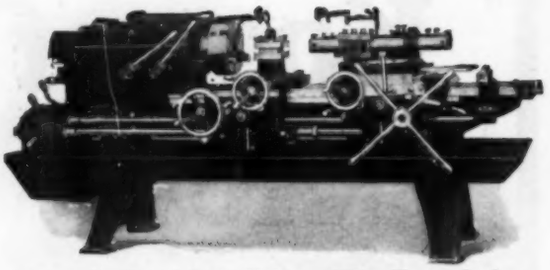
THE KEMPSMITH MANUFACTURING COMPANY
MILWAUKEE, WISCONSIN



Cutting series of keyseats with a single set-up.

KEMPSMITH

"Without any danger of injury"



No. 2 Cincinnati-Acme Universal Flat Turret Lathe

When the rapid traverse of a Cincinnati-Acme turret lathe is in operation the power feed to the turret is thrown out automatically. The pilot hand wheel does not revolve, allowing the operator the convenience of a pilot handwheel design and protecting him from all danger.

The many other advantages of Cincinnati-Acme turret machinery are detailed in the Catalogs. Send for copies.

Write for our bulletin today

Acme Machine Tool Co.
Cincinnati, Ohio

AGENTS

DOMESTIC: Henry Prentiss & Co., Inc., New York City; Boston, Mass.; Buffalo, N. Y.; Syracuse, N. Y.; Rochester, N. Y.; Hartford, Conn.; Motch & Merryweather Machinery Co., Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; Cincinnati Ohio. Marshall & Huschart Machinery Co., Chicago, Ill. Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind. Robinson, Cary & Sands Co., St. Paul and Duluth, Minn. Elliott & Stephens Machinery Co., St. Louis, Mo. W. E. Shipley Machinery Co., Philadelphia, Pa. Kemp Machinery Co., Baltimore, Md.; R. S. Armstrong & Bro. Co., Atlanta, Ga. Hendrie & Bolthoff Mfg. Supply Co., Denver, Colo. Hausman-Henrick Machine Tool Co., Birmingham, Ala. Harron, Rickard & McCone, San Francisco, Los Angeles, Woodward, Wight & Co., Ltd. New Orleans and Houston. Huey-Philp Hdw. Co., Dallas, Texas. Salt Lake Hardware Co., Salt Lake City, Utah.

Production up—cost down—Butterfield Taps

The entire group of Butterfield Taps are hard hitting units that have been built to stand the gaff of work that other taps cannot handle.

There is a Butterfield waiting to show you many things about tapping production and cost cutting. We will be glad to assist in the selection of the right unit. The Tap itself will do the rest.

BUTTERFIELD THE BETTER TOOLS

The spiral point throws the chips ahead

BUTTERFIELD & CO. DIVISION
Union Twist Drill Co.

Send for the catalogs.

Tell us of your tapping problems

Derby Line, Vt., U. S. A. Rock Island, Quebec, Canada
Stores: New York, 62 Reade St. Chicago, 11 So. Clinton St. Detroit, 406 E. Woodbridge St., Toronto, 220 King St., West. Montreal, 131 St. Paul St., West
Domestic Agents: The Evans Bros. Hdwe. Co., Cincinnati, O. C. H. Wood Co., Syracuse, N. Y. Cook Iron Stove Co., Rochester, N. Y. Walbridge & Co., Buffalo, N. Y.

If You Think Your Costs Can't Be Reduced

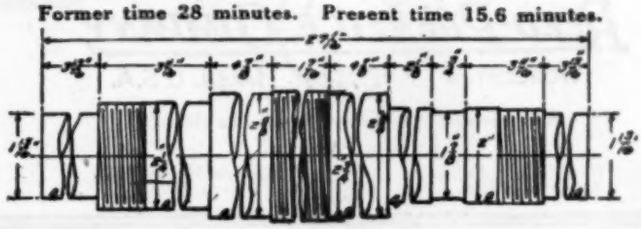
Look at the example shown

A large machine tool company* which has a nationwide reputation for efficient production installed a LANDIS Hydraulic Grinder. Imagine their pleasant surprise when they check the production from this machine with what they had been getting from their previous machines.

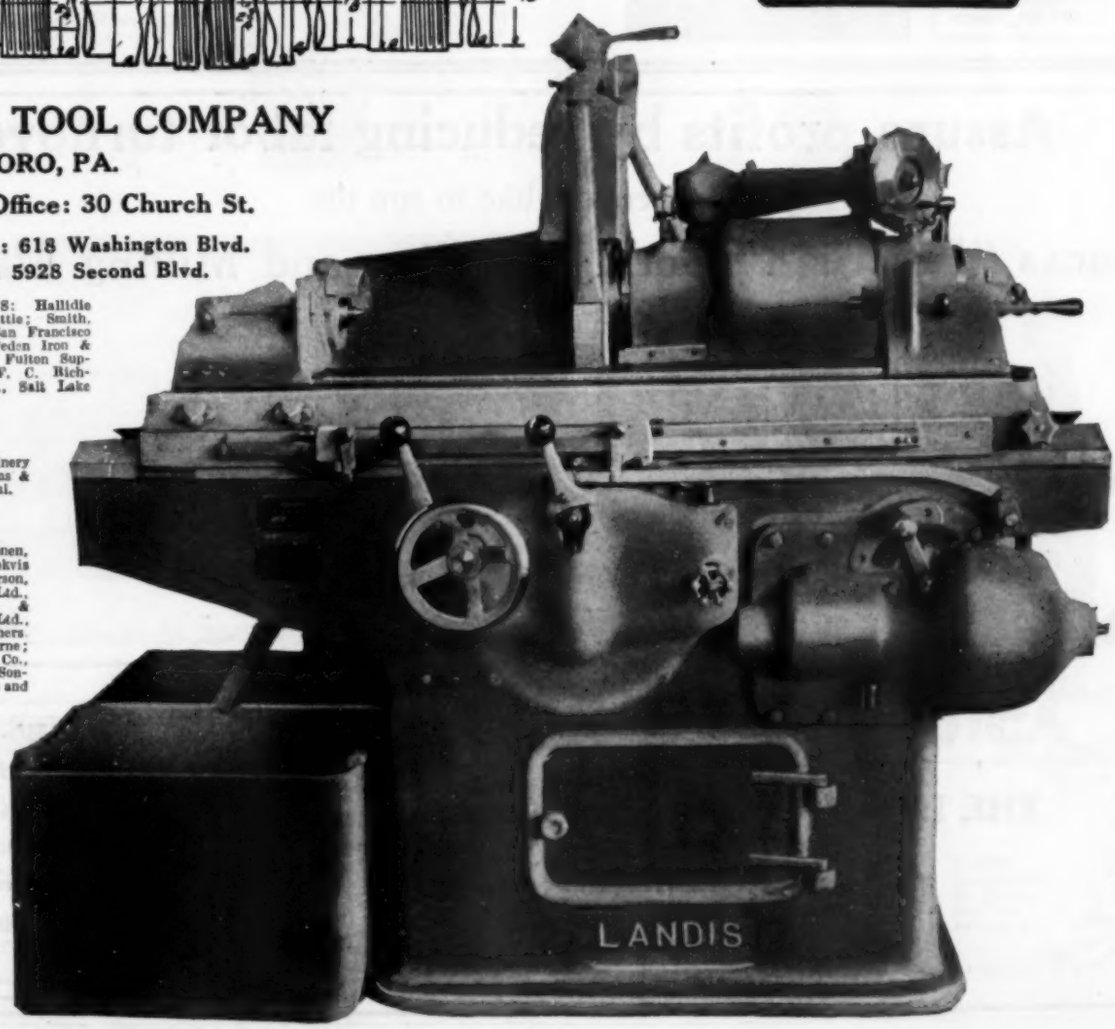
They were skeptical at first as to whether this machine would be a paying investment. They are no longer skeptical but are enthusiastic boosters for this wonderful machine.

*Name on request

Former time 28 minutes. Present time 15.6 minutes.



LANDIS



LANDIS TOOL COMPANY
WAYNESBORO, PA.

New York Office: 30 Church St.

Chicago Office: 618 Washington Blvd.
Detroit Office: 5928 Second Blvd.

DOMESTIC AGENTS: Hallidie Machinery Co., Seattle; Smith, Booth, Usher Co., San Francisco and Los Angeles; Peden Iron & Steel Co., Houston; Fulton Supply Co., Atlanta; F. C. Richmond Machinery Co., Salt Lake City.

CANADIAN AGENTS:

F. F. Barber Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS:

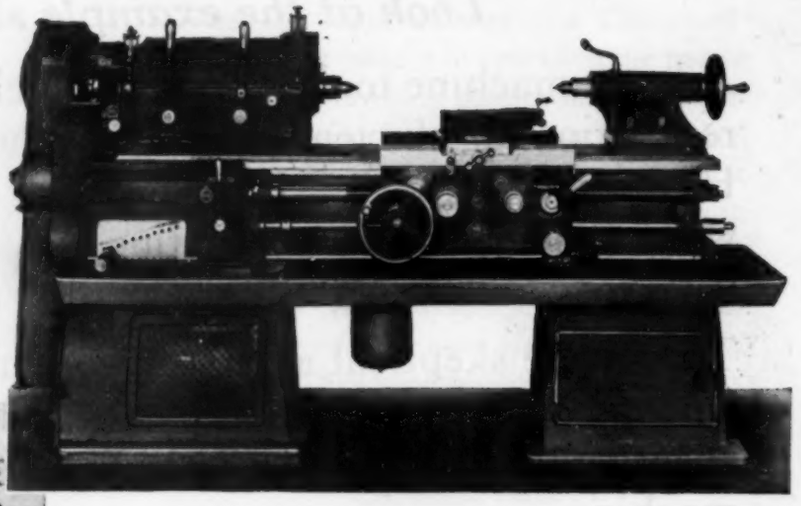
R. S. Stokvis & Zonen, Rotterdam; R. S. Stokvis & Fils, Paris; Anderson, Meyer & Co., Ltd., Shanghai; Andrews & George Company, Ltd., Tokyo; Benson Brothers Sydney and Melbourne; Burton Griffiths & Co., Ltd., London; Wilh. Sonnesson & Co., Malmo and Copenhagen.

The Logical Type of Motor Drive

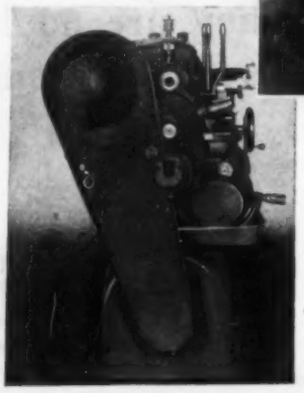
Compactness in Motor Drive construction with minimum loss of floor space, accessibility of motor and reduction of vibration is secured with the Ford type of motor drive when the motor is mounted within the head end cabinet leg.

Our first Geared Head Lathe installation of this kind in 1919 included fifty 14-in. lathes at one of the foremost apprentice schools in the middle west. Since then a countless number of machines have been added to the school and industrial fields even to the foreign countries including Chile in South America.

Reed-Prentice equipment, standard or special, offers the best in design for the profitable handling of every class of work. LET US FIGURE ON YOUR NEXT INSTALLATION.



Why hamper your skilled men with obsolete equipment



REED-PRENTICE MACHINE TOOLS

PRODUCTS
Lathes
Radial Drills
Becker Millers
Whitcomb Planers
Production Cutters
Special Machinery

REED-PRENTICE COMPANY
WORCESTER MACHINE TOOLS MASS. U.S.A.

Representatives Throughout the World

BRANCH OFFICES:
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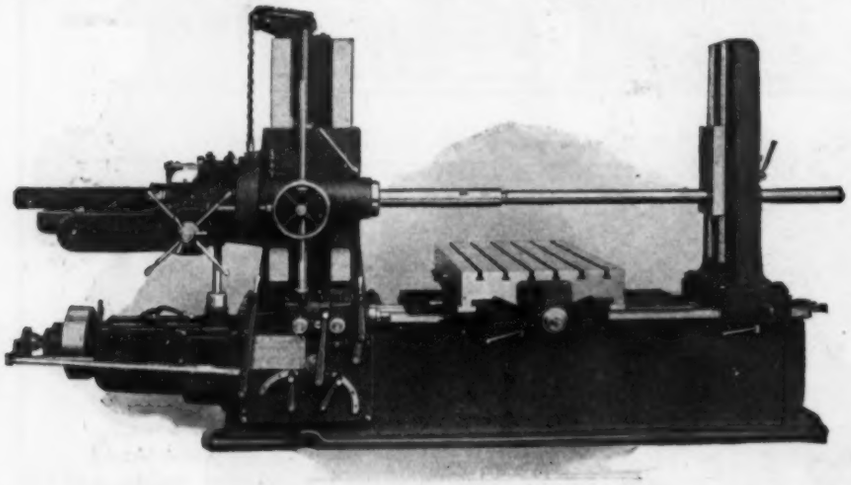
Assure profits by reducing labor turnover

Operators like to run the

Lucas "Precision" Boring, Drilling and Milling Machine



THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND, OHIO

We also make the LUCAS Power Forcing Press

They lay their success to Paragon

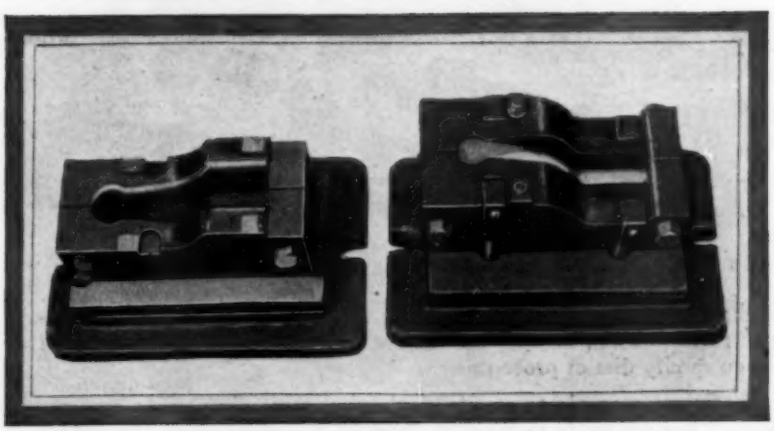
So states a recent report on die work at the Zenite Metal Company, Indianapolis.

The Zenite Metal Company manufactures a wide variety of metal parts for various clients. The company has used PARAGON for nine years, mostly in forming dies. It now has between 400 and 500 PARAGON Dies on the job, working metal from .01 to 3/16 in. in thickness.

Take the job here illustrated as an example—a shovel handle part. The Superintendent calls this "one of the hardest jobs the Company has ever tackled." The set of PARAGON Dies turns out 10,000 parts a day with high satisfaction.

PARAGON Oil Hardening Tool Steel has a growing reputation, among exacting users, for its hardness, its refinement of grain, its stand-up qualities under tough service. Scores of manufacturers, for instance, are using it exclusively on forming dies—producing hundreds of thousands of simple or intricate parts with only minimum attention to the dies.

Where Wheels Turn, Turn to CRUCIBLE



We carry PARAGON in all sizes—annealed — at our branch warehouses listed below.

CRUCIBLE STEEL COMPANY OF AMERICA

General Offices

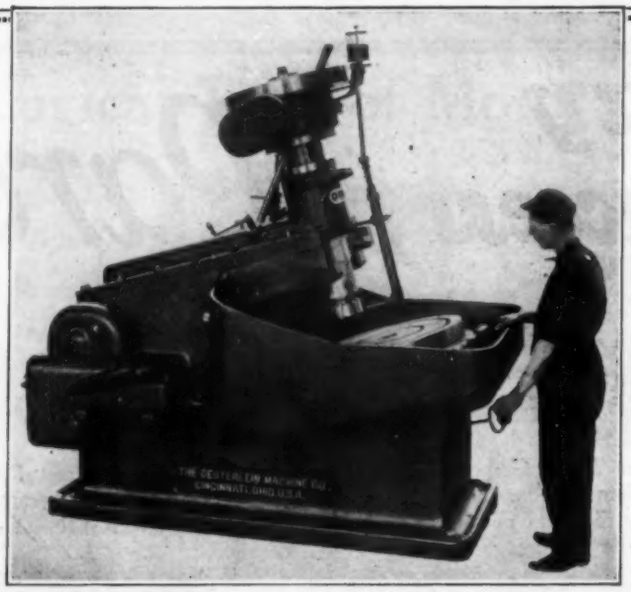
17 East 42nd St., New York, N. Y.

BRANCH OFFICES AND WAREHOUSES

Baltimore, Boston, Buffalo, Chattanooga, Chicago, Cincinnati, Cleveland, Denver, Detroit, Hartford, Indianapolis, Milwaukee, New Haven, New York, Philadelphia, Pittsburgh, Providence, San Francisco, Seattle, Springfield, St. Louis, St. Paul, Syracuse

Montreal, Toronto, London, Tokio

THE HIGHEST DEVELOPMENT IN STATION MILLING



CUTTERS NEVER CUT "air"—

THE OHIO TILTED ROTARY

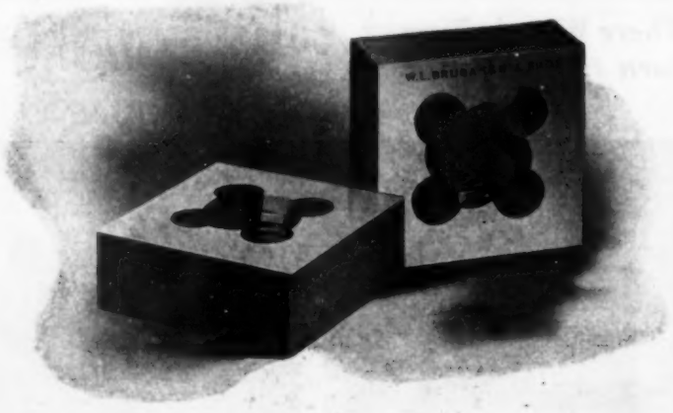
Four times the production of standard Milling Machines—that is what time studies show, in comparison with the relative output between the Ohio Tilted Rotary and the usual milling methods. A cheap operator clamps the parts—the reciprocating spindle feeds the cutters into the work and withdraws, until the table indexes to the next position. No time loss, when cutters "cut air" as with one-speed continuous milling machines. A large part with a small surface can be handled efficiently, because the table indexes between the feed-in strokes—impossible in continuous milling.

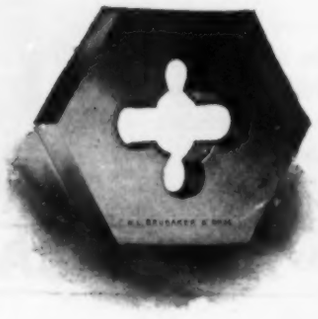
Other advantages such as the fly-wheel spindle, that insures a smooth chatterless finish, the tilted design that permits an ample flow of coolant for the highest speeds, etc.—all are outlined in an illustrated catalog.

Just tell us where to mail it, or send a layout for a production estimate

THE OESTERLEIN MACHINE CO., Cincinnati, Ohio

Interchangeability Insured with BRUBAKER DIES





Screw threads are of utmost importance in the manufacture of interchangeable parts and in boiler making and repairs. They must not vary, and will not if you specify dies of proven merit.

Brubaker Dies are made to standards that guarantee habitually accurate threads. They are made in types to meet all threading needs. Standard sizes stocked, specials on ten-day deliveries.

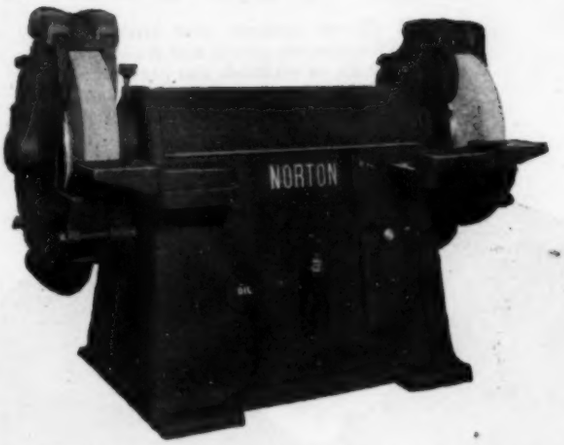
If you have experienced trouble with your threading operations, get in touch with us. We have given relief in hundreds of instances. Look up our line of Taps, Dies, Reamers, Screw Plates and other small tools in the late catalog.

W. L. BRUBAKER & BROS. CO.

Factory at MILLERSBURG, PA.

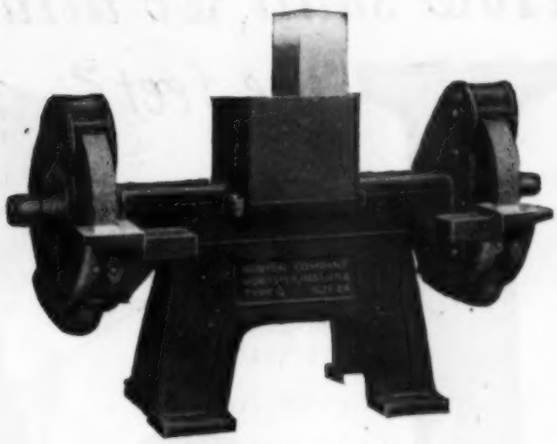
Sales Office: **50 Church St., New York**

Reduce Your Snagging Costs



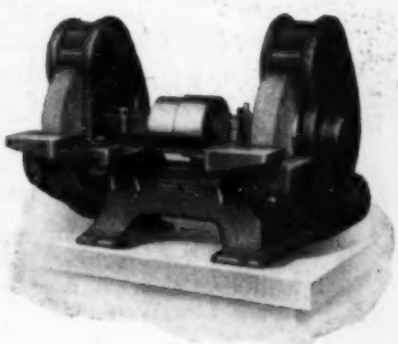
Motor Driven Floor Stand. The "Motor in the Base" Machine
Sizes:—16, 20 and 24 *In.*

TYPE S



Belt Drive Floor Stand
Sizes:—14, 16, 20 *and* 24 *In.*

TYPE Q



Belt Drive Bench Stand
Sizes:—6, 8, 10, *and* 12 *In.*

TYPE P

YOU will save money in snagging castings and on general off-hand grinding operations if you purchase heavy, rigid, well-designed bench and floor stands.

Norton stands are known for their ability to produce at low cost because of their

Weight
Rigidity
Long Life

Norton stands have strong guards that conform to the most rigid safety regulations.

Write direct or to nearest branch office for further information.

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Hartford
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M-141

NORTON GRINDING MACHINES

Let's BUILD

build (5)—to increase and strengthen: to increase the power and stability of: to settle or establish and preserve:
—*Webster*

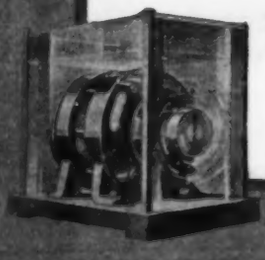
How shall we attach the feet?

There are two ways, lad, to put them on—you can either rivet them or bolt them in place.

No, pop . . .

with either method the feet will shake loose in time and customers don't want a rollicking motor.

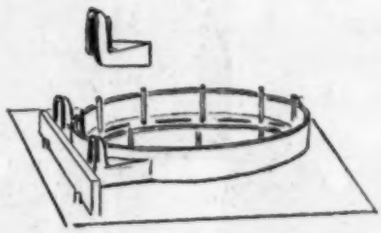
Let me sketch out for you how to BUILD (see Webster) the feet into the machine as done exclusively in the Linc-Weld.



LINC

a motor! with the Stable-Arc welder

First, you take good husky drop-forged feet. . . . . so



—and you jig them to exact place on the steel frame . . so

—and by the same Stable-Arc process which made the Linc-Weld the strongest frame in the world—you have made feet and frame one solid piece.

Now you can take a sledge and flog the duff out of such feet and you can't separate them from the frame—or break them.

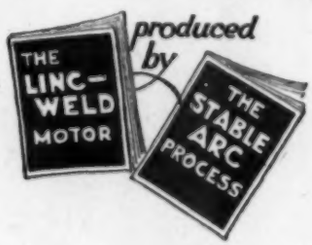
Note that the feet are welded in place always parallel to the shaft. The motor can't rock when mounted on a true base.

This is but one of a dozen cases in building the Linc-Weld motor where the Stable-Arc has worked for the motor buyer. It has given him a stronger construction and saved us enough money to give him extra strong insulation and higher cost windings.

You can think of a number of places in your work where the Stable-Arc will give you the same short cut to better construction. Read the book on the right.

Illustrated answers

Realizing that the news value of the new process motor, as well as the process by which it is constructed, will naturally bring up many questions—two very completely illustrated volumes have been prepared thoroughly covering the subjects:



These books are in envelopes ready to be sent by return mail to all persons requesting them.

For your convenience in getting your copies—simply pencil in your address on the coupon below.

The Lincoln Electric Co.

Cleveland, Ohio

-WELD

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To The Lincoln Electric Co., Cleveland, Ohio

Please send to Mr. .....

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The Motor Book ☐
The Stable Arc Process Book ☐

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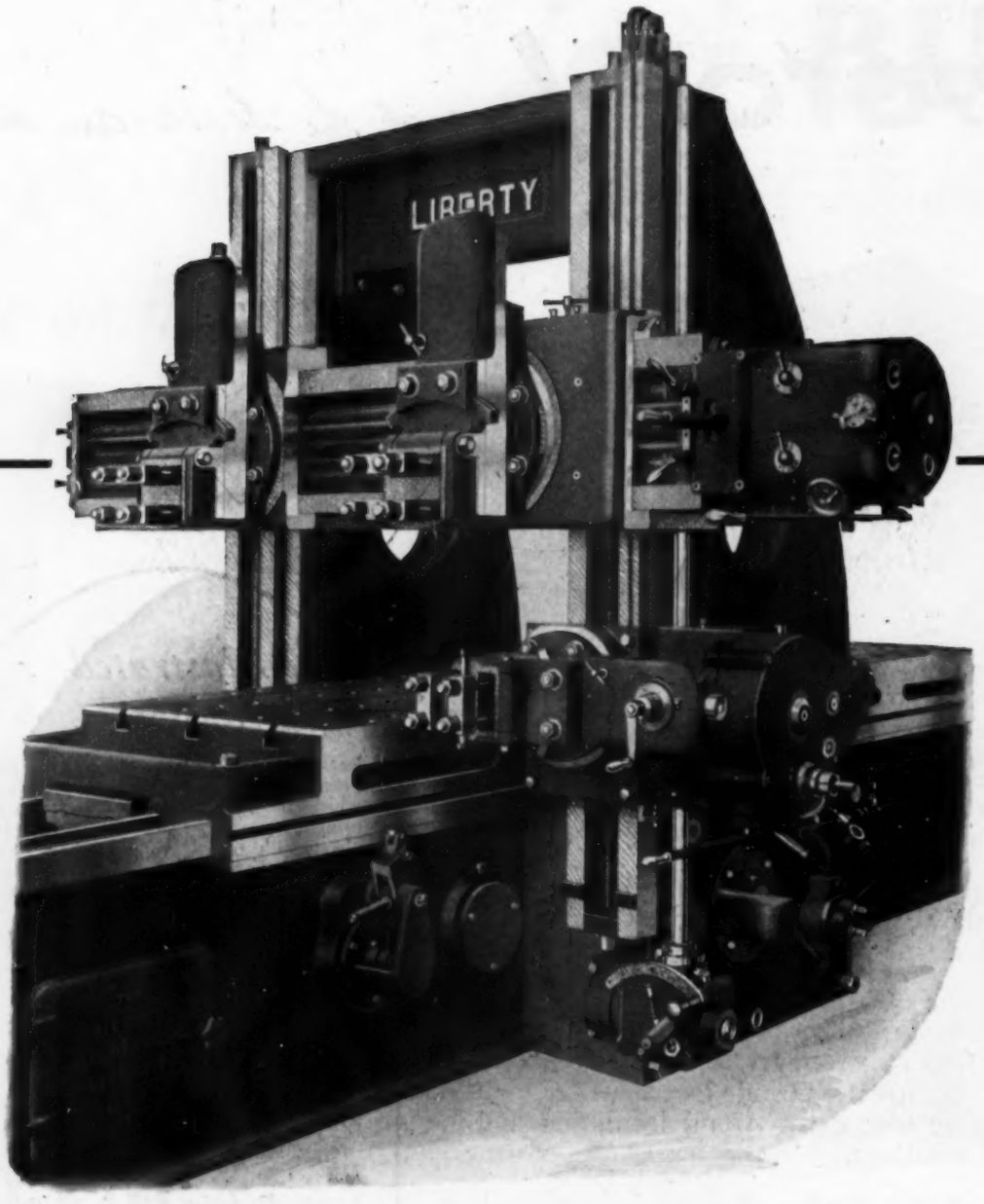


The New Liberty has practically eliminated

backlash

The screws for elevating the rail and rapid-traversing the rail-heads vertically by power are stationary and in tension at all times. The nuts revolve around the screws.

In this we have reduced back lash to the point of practical elimination.

There are many other features about the new Liberty Planer—twenty-four in all—which are of vital importance to every owner of a machine of this type. We will be pleased to send you the complete data upon receipt of your request.

Send for bulletins that give all the special features

The Liberty Machine Tool Co., Hamilton, Ohio

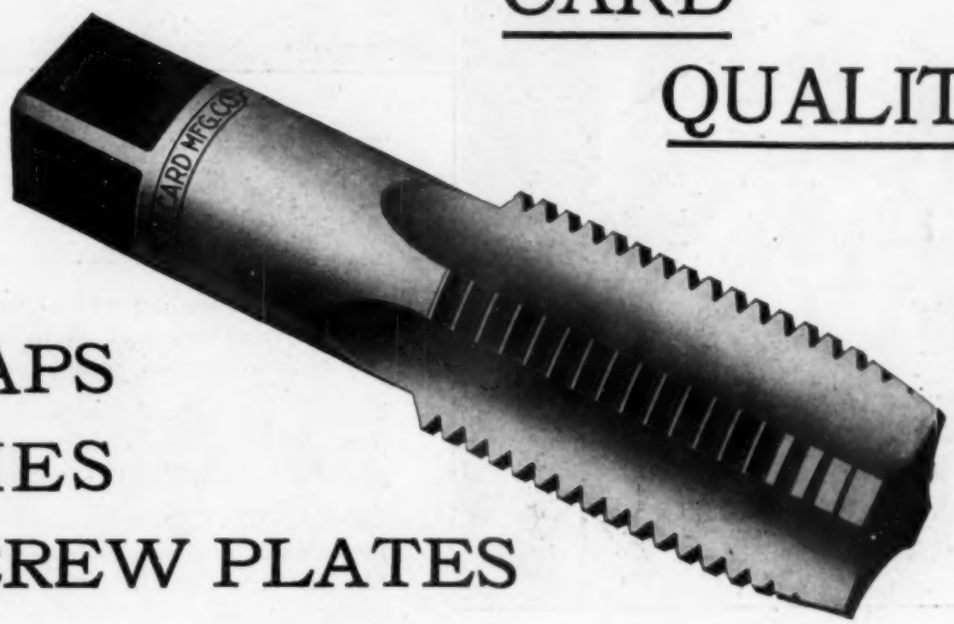
1926

A HAPPY NEW YEAR!

And a Prosperous One

if you are using

CARD QUALITY

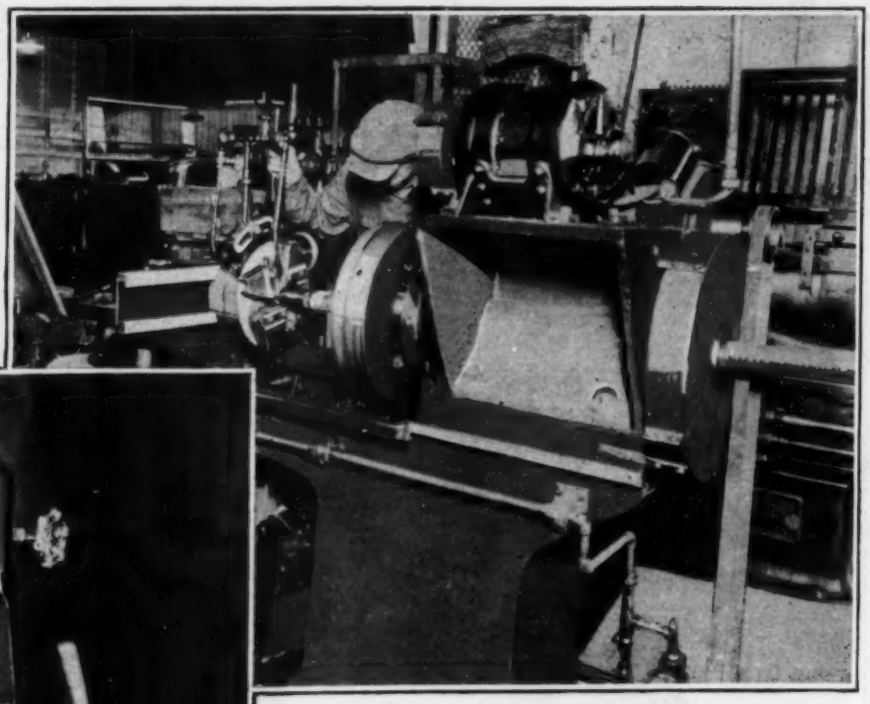


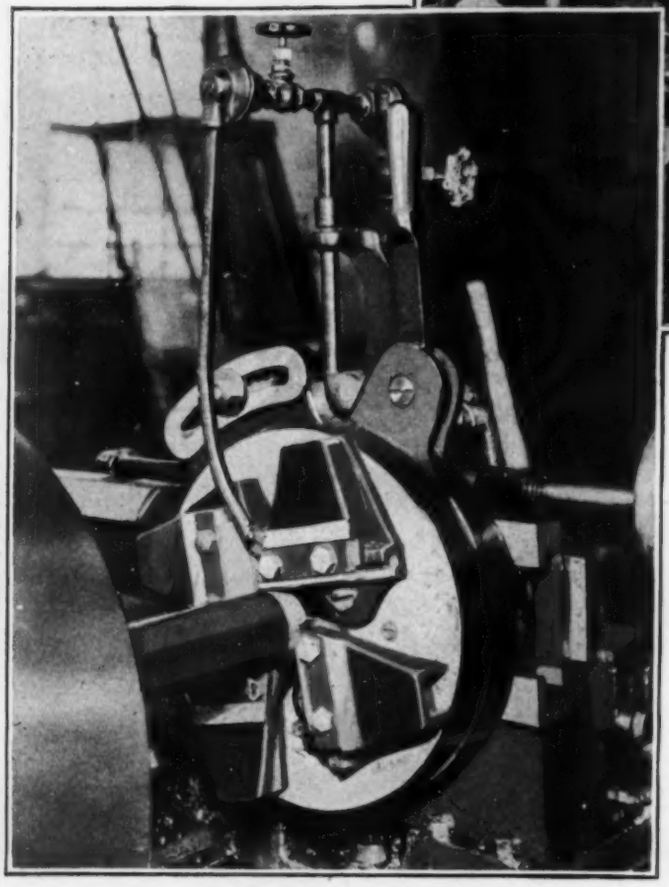
TAPS
DIES
SCREW PLATES

Since 1874 We Have Been Leaders
In Our Line. Need We Say More?

S.W.CARD MFG. CO.
DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS, U.S.A.

LANDIS Chasers Are Unsurpassed





IN the gas, oil and high pressure fields pipe threads are highly important factors.

Little leaks mean large losses and every means is employed to insure tight threads.

LANDIS Threading and Cutting Machines predominate in these fields because they do habitually good work.

They cut clean, fast and stand up to the tough jobs. Their high-grade performance is due primarily to the **LANDIS Chaser.**

The **LANDIS Chaser** is the only forward step in the design of threading tools in the last fifty years. Its line contact with the stock—its variable rake or cutting angle—its right and left-hand threading feature with the same chasers—its interchangeability—its close to shoulder threading feature throughout its entire length—its simple grinding feature—its long life—are just a few distinctive features not found in any other die.

Look up the **LANDIS.**

LANDIS
Pipe Cutting and Threading Machines

LANDIS MACHINE COMPANY, Waynesboro, Pa.

Detroit Office: 5928 Second Blvd.

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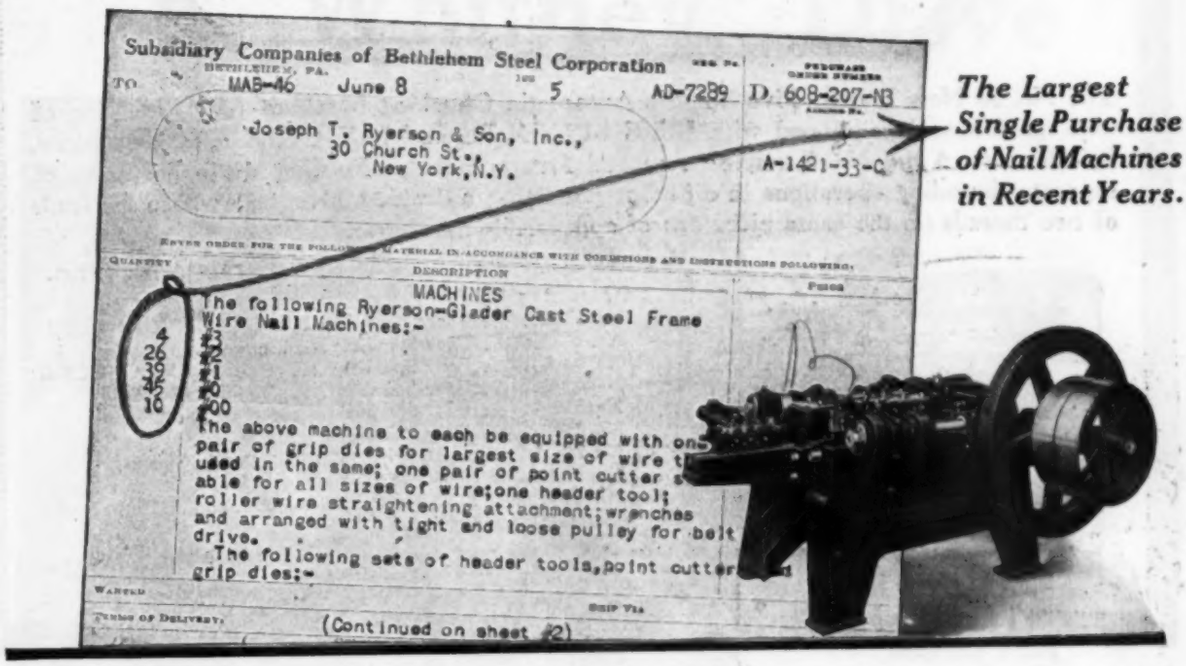
Bethlehem Buys 124
Ryerson-Glader Nail Machines


Subsidiary Companies of Bethlehem Steel Corporation
BETHLEHEM, PA.
TO MAB-46 June 8 5 AD-7289 D 608-207-NB
Joseph T. Ryerson & Son, Inc.,
30 Church St.,
New York, N.Y.
A-1421-33-C
QUANTITY DESCRIPTION PRICE
MACHINES
The following Ryerson-Glader Cast Steel Frame
Wire Nail Machines:-
4
26
39
45
10
The above machine to each be equipped with one
pair of grip dies for largest size of wire t
used in the same; one pair of point cutter s
able for all sizes of wire; one header tool;
roller wire straightening attachment; wrenches
and arranged with tight and loose pulley for belt
drive.
The following sets of header tools, point cutter
grip dies:-
WANTED SHIP VIA
TERMS OF DELIVERY
(Continued on sheet #2)

The Largest Single Purchase of Nail Machines in Recent Years.

THE steel frame and general rugged construction of the Ryerson-Glader Nail Machines assures their standing-up under heavy production. The Bethlehem Company has just bought 124 of these machines. 16 Ryerson-Glader Barbed Wire Machines were also included in the order.

The Ryerson-Glader Nail and Barbed Wire Machines are but two of many Ryerson Machines which have such features as sturdy construction, accuracy and high production enabling them to stand the greatest test of all—continuous production in a modern shop.

Ryerson Machinery Service includes a complete line of improved machine tools and metal-working equipment, with an experienced staff of engineers continually at your service for assistance with any of your equipment problems.

Write for a catalog showing the complete line of machinery and when considering equipment—let Ryerson serve you.

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Established 1842

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Horizontal Drills
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Pneumatic Machinery

Serpentine Shears
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Spring Shop Equipment
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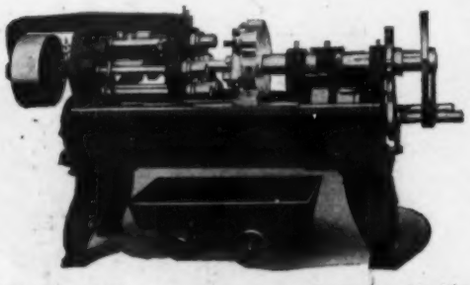
NEW BRITAIN
SUPER PRODUCTION
AUTOMATIC CHUCKING MACHINES
[TOOL ROTATING TYPE]

The No. 33 New Britain Five Spindle Automatic Chucking Machine (one of a line of nine machines) is equipped with FIVE SPINDLES and SIX CHUCKING positions. Spindles No. 4 and No. 5 may be arranged for threading, affording an opportunity of separate threading operations in different positions; a decided advantage where the leads of two threads on the same piece are of appreciable difference.



The COMPLETE LINE of NEW BRITAIN TOOL ROTATING CHUCKING MACHINES is as follows:—

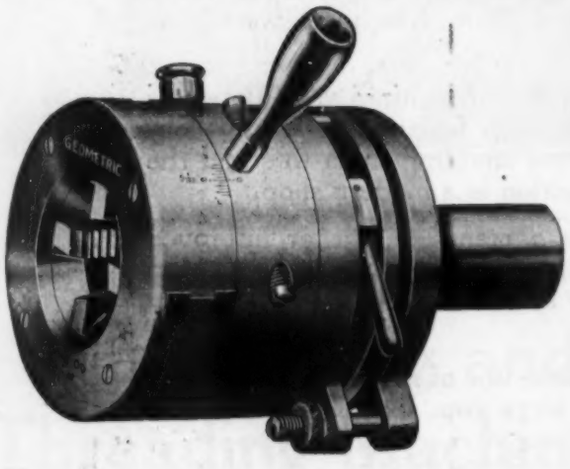
*No. 12-A	Three Spindles	5½-in.	AIR CHUCKS
No. 22	Four Spindles	5¾-in.	Chucks
*No. 23-A	Four Spindles	7-in.	AIR CHUCKS
No. 23	Four Spindles	7-in.	Chucks
No. 33	Five Spindles	7-in.	Chucks
No. 24	Four Spindles	9-in.	Chucks
No. 34	Five Spindles	9-in.	Chucks
No. 53	Double End Three Spindles each end	8½-in.	Chucks
No. 54	Double End Three Spindles each end	9¾-in.	Chucks

*Recent additions to our line.

Builders of New Britain Multiple Spindle Bar Machines—⅝", 1" and 1⅝" capacity, and New Britain New Matic Chucking Machines (Work Rotating Type), two sizes each, Four Spindle and Six Spindle—Maximum Chucking Capacity 5"

The New Britain Machine Company New Britain, Connecticut.

GEOMETRIC



STYLE DD Screw Thread Cutting Die Head for hand-operated turrets.

There is no better method of screw-thread production than the *Geometric*.

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New Haven, Conn.

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are set with carefully selected Diamonds of the Best Quality. Security of the Special Setting Guaranteed. The name "Dickinson" is stamped on all tools. We are proud of a long record of satisfactory service.

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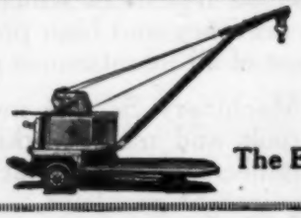

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Each Built for Special Lift and Carry Service
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Cleveland, Ohio

Improve the Appearance of Your Machines

Rockwood Pressed Steel Machine Handles are uniform in shape. Their clean-cut lines enhance the appearance of your machines. Coupled with this they are strong and light.

Made in eleven sizes from cold drawn strip steel. Let us send you samples and quote prices.

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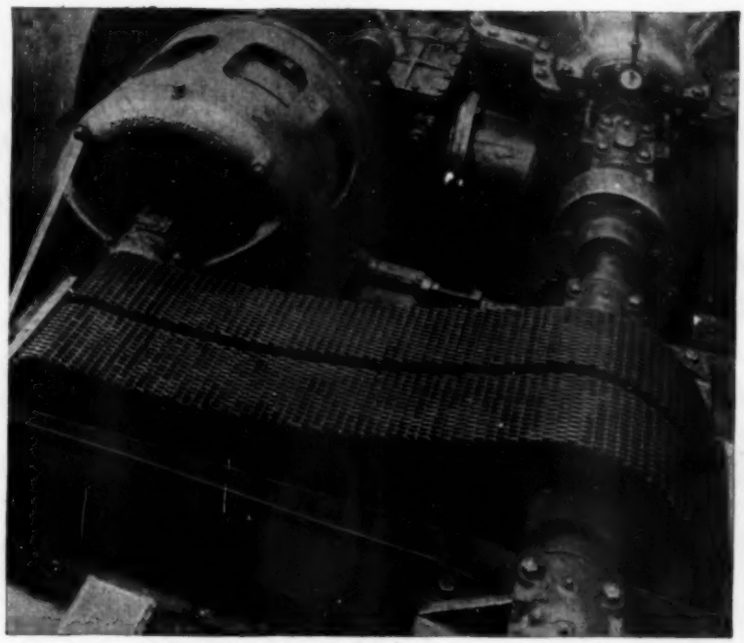
Moisture can't hurt a "Whitney" Drive



Specifications
125 H.P.
685 to 270 R.P.M.
51¾ in. centers

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Double Concentric Bearing Joint

The Centrifugal Pump Drive shown above is just another illustration of the convenience and economy of using

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Short centers and compactness, positive driving power and flexibility, high efficiency and long life: these advantages are not affected by moisture or temperature.

There is a "WHITNEY" chain for practically every power transmission application.

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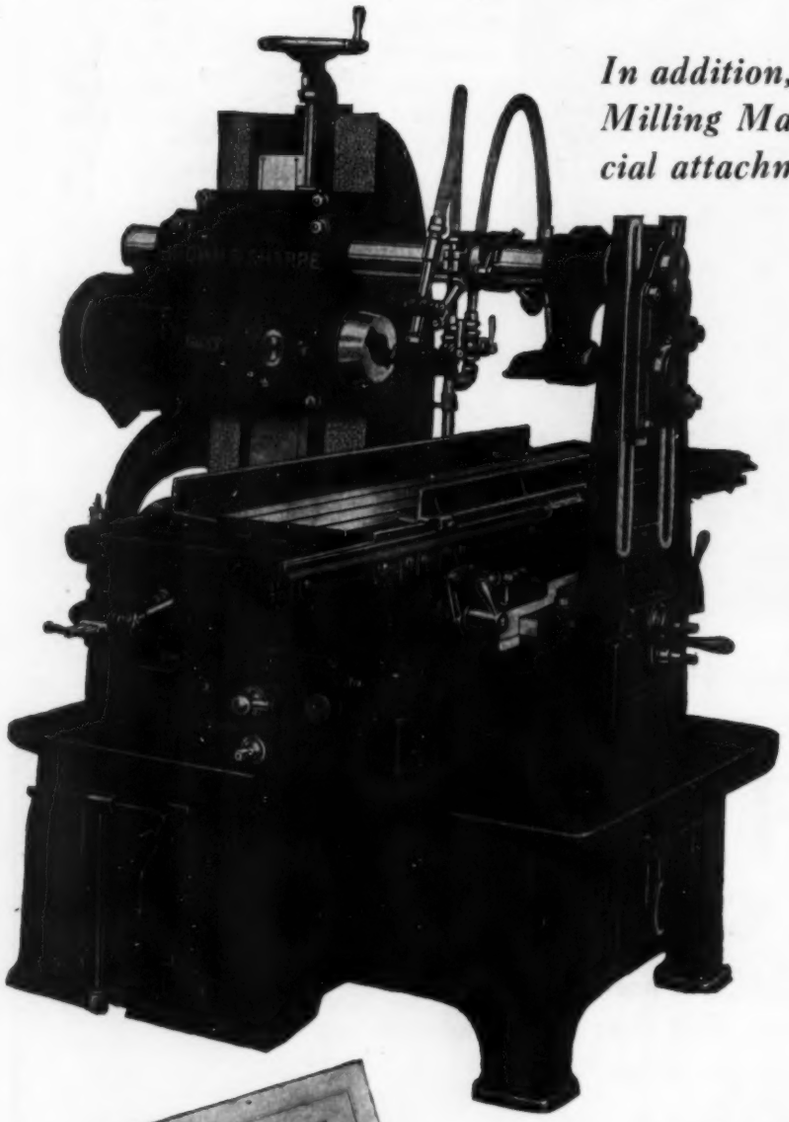
The Automatic Features of These Standard Machines Increase Production and Lower Costs—



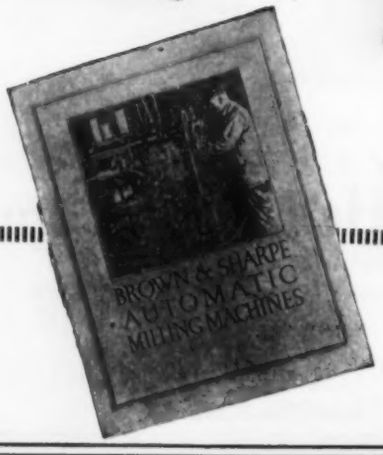
In addition, the Nos. 21 and 33 Automatic Milling Machines lend themselves to special attachments for single operation work

To meet increasing competition, high production rates must be obtained. Standard machines, with high production capacities as well as adaptability to a broad field of work are desirable.

The Nos. 21 and 33 Automatic Milling Machines are designed primarily for quantity production of interchangeable parts. The operation of both table and spindle is fully automatic and may be controlled either by hand or by table dogs. A fast table travel of 210 inches per minute in addition to the reversibility of both table and spindle are other features which enable the machines to cover a broad range of work.

In addition, they possess some of the characteristics of special machines. They are readily adapted for use with special fixtures and attachments which enable them to function as single purpose machines and cover a broad range of work.

A decided advantage over the special machine, is that any change in the product affects the attachment only—the machine itself being immediately available for other work or on the same job with a new attachment.



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BROWN & SHARPE MFG. CO.

It's the Hardening That Puts the "Cut" in Cutters—

and our seventy-five years of heat treating experience is apparent in every Brown & Sharpe Cutter

There is nothing mysterious about a cutter, any more than there is about the blade of a knife.

Shape, size, design of tooth, etc., are points which depend on the style of the cutter, the purpose for which it is to be used and the contentions of cutter manufacturers.

The important feature, that upon which the efficiency of the cutter depends, is the hardening. Regardless of how properly a cutter is designed, how accurately machined, it cannot give efficient service unless properly hardened.

Three things are responsible for the performance of Brown & Sharpe Cutters—our experience of seventy-five years as cutter manufacturers—the materials used for making the cutters—and the careful way in which they are heat-treated. Together they give to each cutter a proper balance of power and strength, and a toughness which keeps the cutting edges sharp under severe conditions.

Catalog No. 138 *lists our entire line of Machines, Tools and Cutters. Send for a copy.*

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Over 300 New Machines and Tools!

The Shop Equipment Review and Catalog Number of AMERICAN MACHINIST will contain descriptions and illustrations of *over* 300 new and improved machines and tools.

Think what a wealth of ideas for you production men!

And not alone in the editorial pages of this issue will you find a wealth of ideas.

In the advertising pages of the same issue the machine builders of America will tell their story in full—will describe and picture all the machines, tools and equipment that mean better, faster output.

Naturally you are looking forward to this impressive issue.

As with its predecessors, its value will run far beyond its own week and month. You production men will keep it at hand for many months to come as reference and guide.

Remember the date—January 21.

January 21, 1926

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Starrett Tools

8674

EVANSteel Electric Furnace Castings require a minimum amount of machining by the manufacturer. That's a big saving.

The truth of this is evidenced by the cast steel tractor frame shown here. The Chicago Steel Foundry Company produces these castings in thousand lots. So accurate are they that they gauge within less than ⅛" to B/P measurements from any point to any point on the casting. This is almost "machined dimensions" for accuracy.

A lot of work is saved the manufacturer. For instance, the bottom bearings, which hold three pieces of stationary shafting on which the idlers turn, are not machined at all--these bearing surfaces are smooth enough just as they come from the EVANSteel foundry.

With this unusual accuracy, great strength is obtained--it's needed in this main casting that gets all the strain. And with EVANSteel, light weight is also secured.

Accuracy of size and analysis is assured by the great care with which EVANSteel Castings are produced--from melting to final inspection.

Find out more about EVANSteel service. If you'll send blueprints of your castings to us, and tell us in what quantity they are needed, we can quote you on their production by the EVANSteel process. We'll be glad to send an engineer if you prefer.

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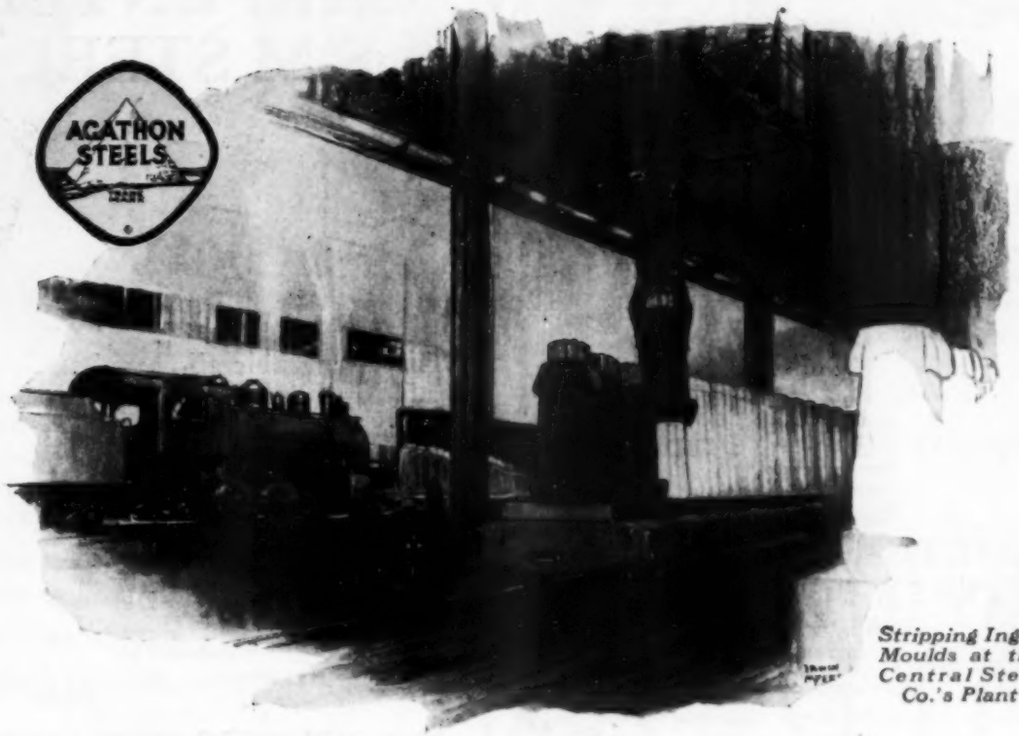
EVANSteel
Electric Furnace
CASTINGS

AM12-31B-RTG



Stripping Ingot Moulds at the Central Steel Co.'s Plant

Metallurgical Help Without Charge

IF you have a problem in steel that baffles you, we will place at your disposal our staff of metallurgical experts, practical steel men and chemical and physical laboratories unsurpassed in America—and we will render this assistance without charge. The answer to your problem may be found in one of the Agathon Alloy Steels we have in daily production. If not, a special analysis of steel will be formulated to meet your individual requirements. Avail yourself of this assistance. It means no obligation on your part.

We have daily production in all kinds of Agathon Alloy Steels such as—

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Deliveries in Blooms, Billets, Slabs, Hot Rolled, Heat Treated, and Cold Drawn Bars, Hot Rolled Strips, etc.

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To Make Both
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has developed laboratory precision on a production basis in selection of materials, in furnace technique, in forging, rolling, and in the exacting inspection of its products
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This remarkable alloy tool-steel, when suitably hardened and toughened for heavy punching, shows physical strength well in excess of 300,000 pounds per square inch and is, in this condition, almost unbreakable. It will stand extraordinary abuse.
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Better than Babbitt

WEARS LONGER—RUNS COOLER

The Ajax Metal Company

ESTABLISHED 1880

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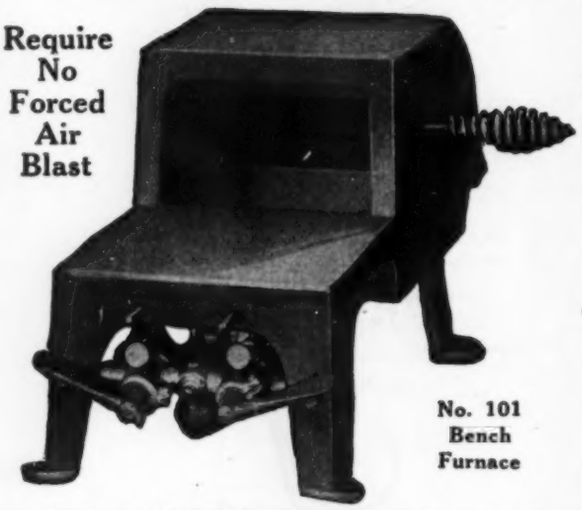

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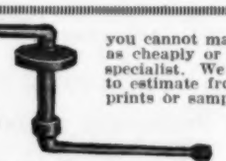

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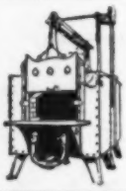

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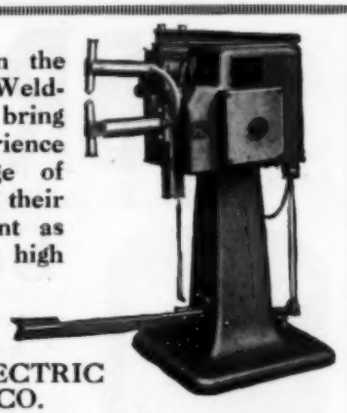

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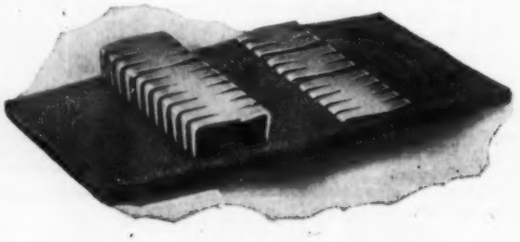

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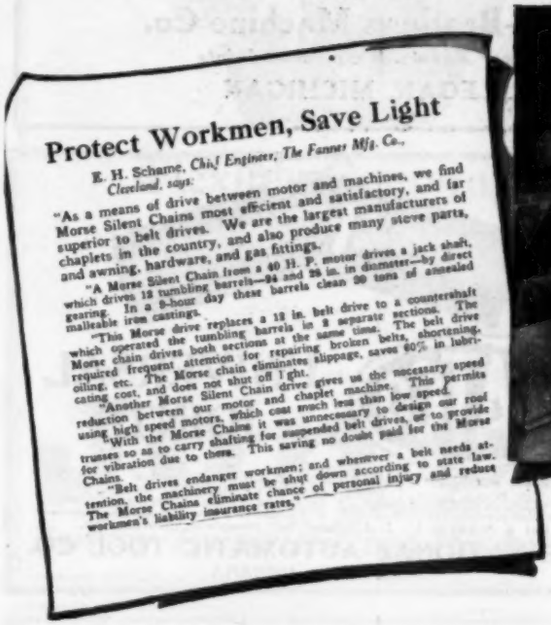

Protect Workmen, Save Light

E. H. Schame, *Chief Engineer, The Fanner Mfg. Co., Cleveland, says:*

"As a means of drive between motor and machines, we find Morse Silent Chains most efficient and satisfactory, and far superior to belt drives. We are the largest manufacturers of chaplets in the country, and also produce many steve parts, and awning, hardware, and gas fittings.

"A Morse Silent Chain from a 40 H. P. motor drives a jack shaft, which drives 12 tumbling barrels—24 and 28 in. in diameter—by direct gearing. In a 9-hour day these barrels clean 30 tons of annealed malleable iron castings.

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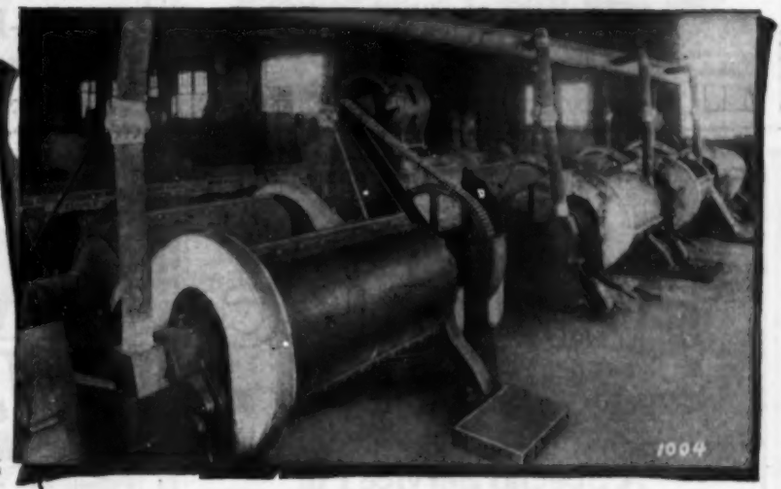
"Another Morse Silent Chain drive gives us the necessary speed reduction between our motor and chaplet machine. This permits using high speed motors, which cost much less than low speed.

"With the Morse Chains it was unnecessary to design our roof trusses so as to carry shafting for suspended belt drives, or to provide for vibration due to them. This saving no doubt paid for the Morse Chains.

"Belt drives endanger workmen; and wherever a belt needs attention, the machinery must be shut down according to state law. The Morse Chains eliminate chance of personal injury and reduce workmen's liability insurance rates."



25 H.P. Morse Silent Chain from motor to line shaft driving 12 tumbling barrels, Fanner Mfg. Co., Cleveland. Driver, 565 r.p.m.; Driven, 100 r.p.m., 54 inch centers.

"Most efficient and satisfactory"

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"Another Morse Silent Chain drive gives us the necessary speed reduction between our motor and chaplet machine. This permits using high speed motors, which cost much less than low speed.

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"The Morse Chains eliminate chance of personal injury and reduce workmen's liability insurance rates."

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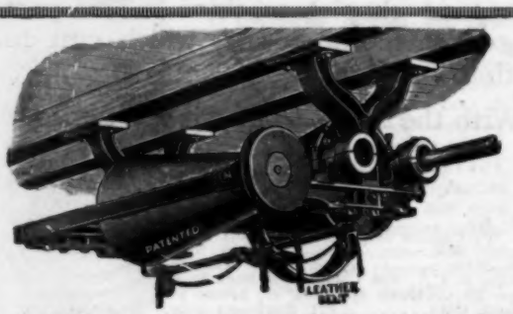

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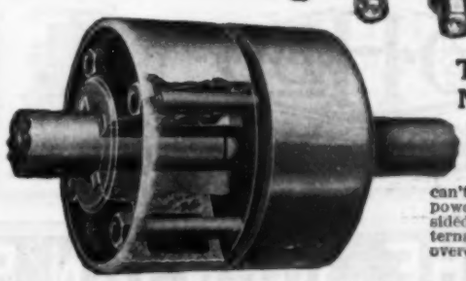

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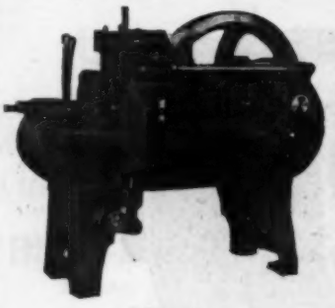

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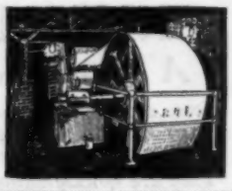

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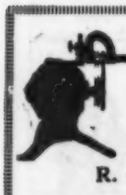

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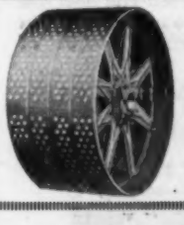

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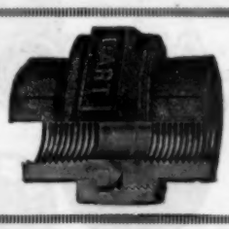

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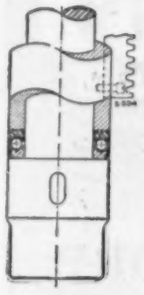

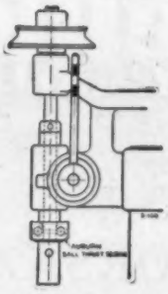

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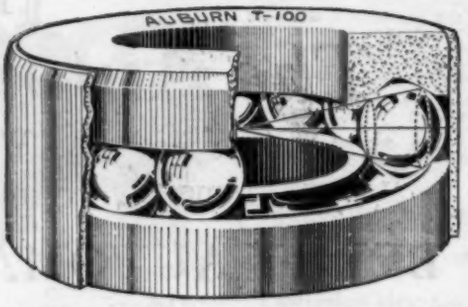

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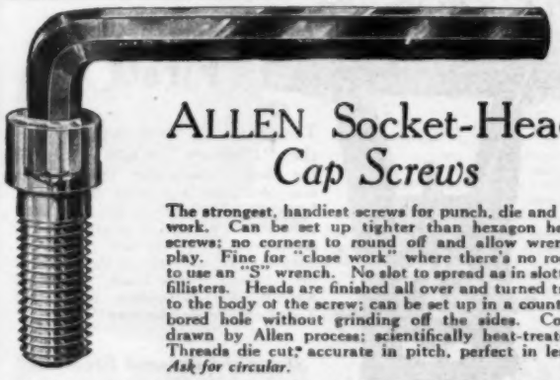

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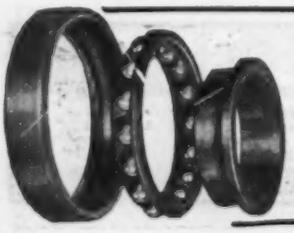

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Here is a sectional view of the Fafnir Double Ball Bearing Hanger Box. Note the long inner ring of the ball bearing, the pressed steel dust caps, and the self-locking collar.

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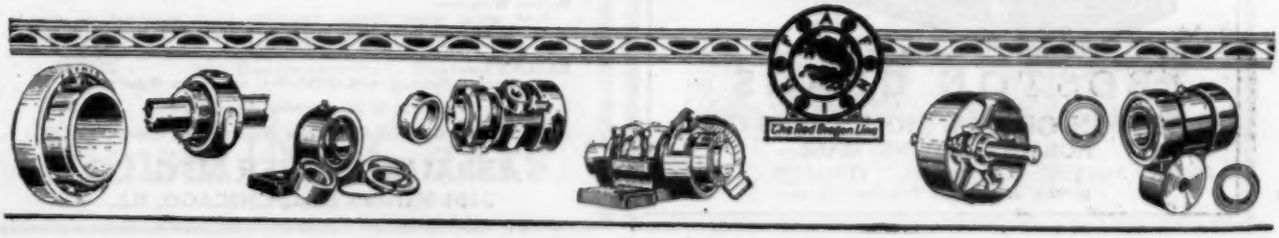

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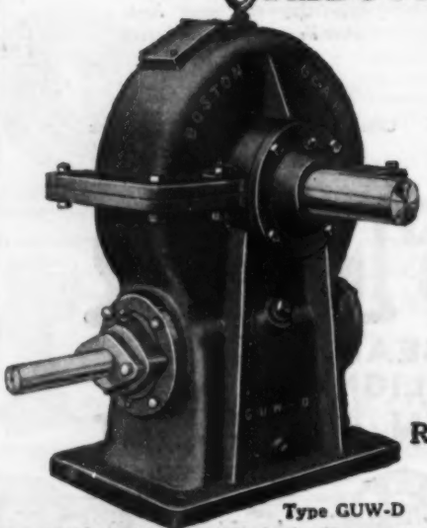

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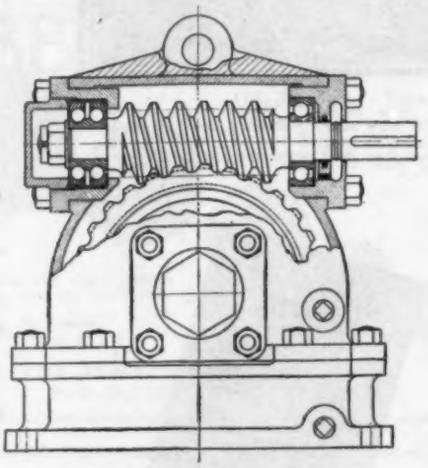

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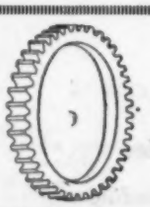

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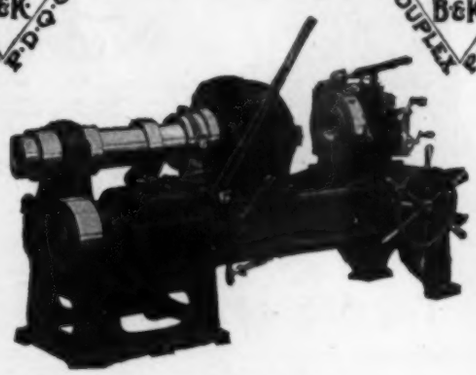

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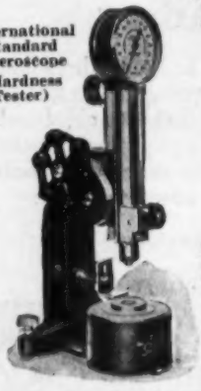

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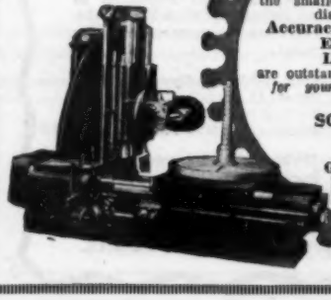

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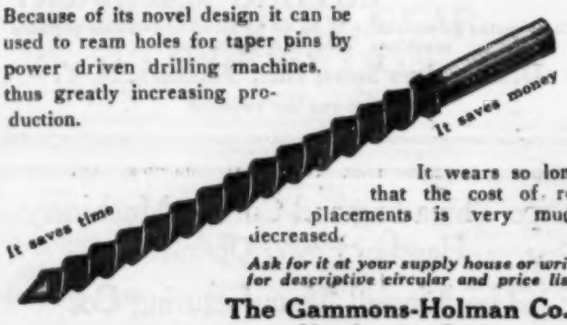

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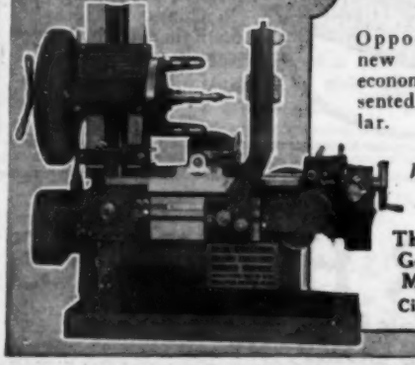

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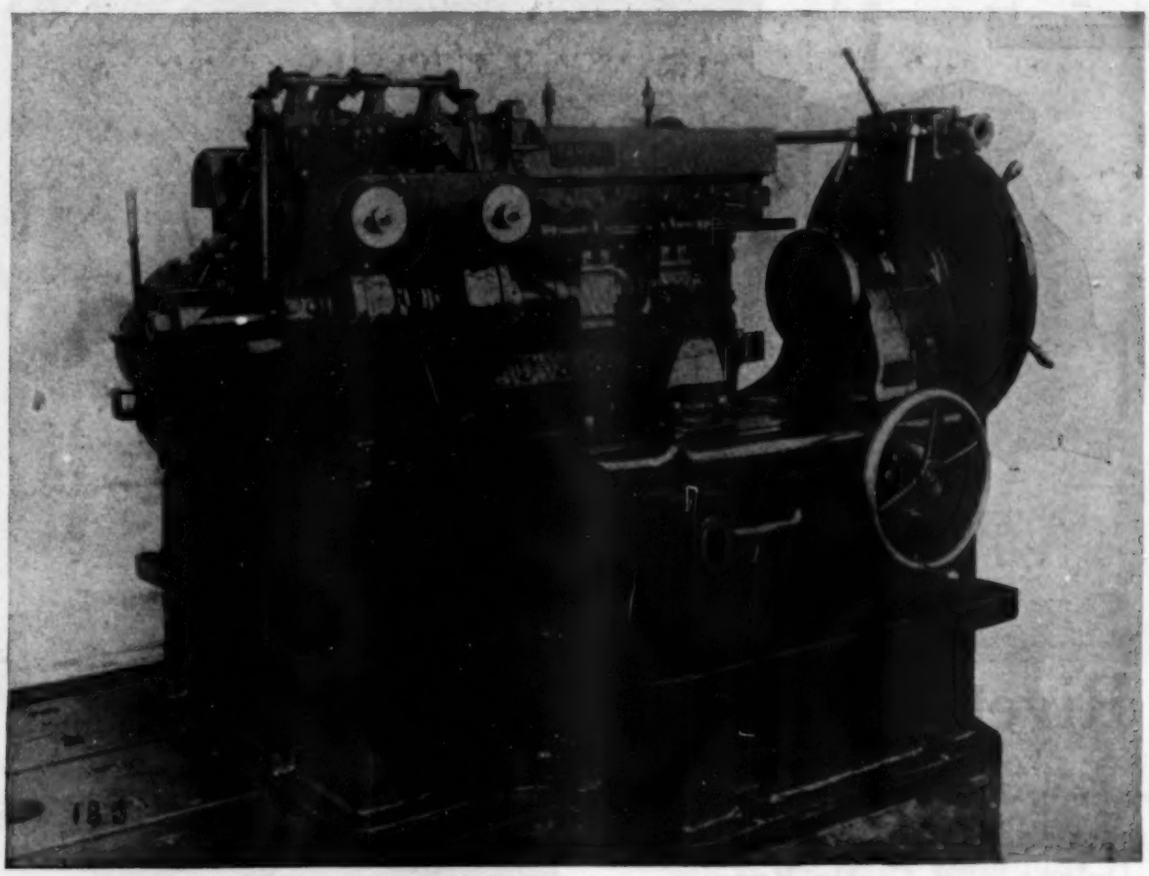

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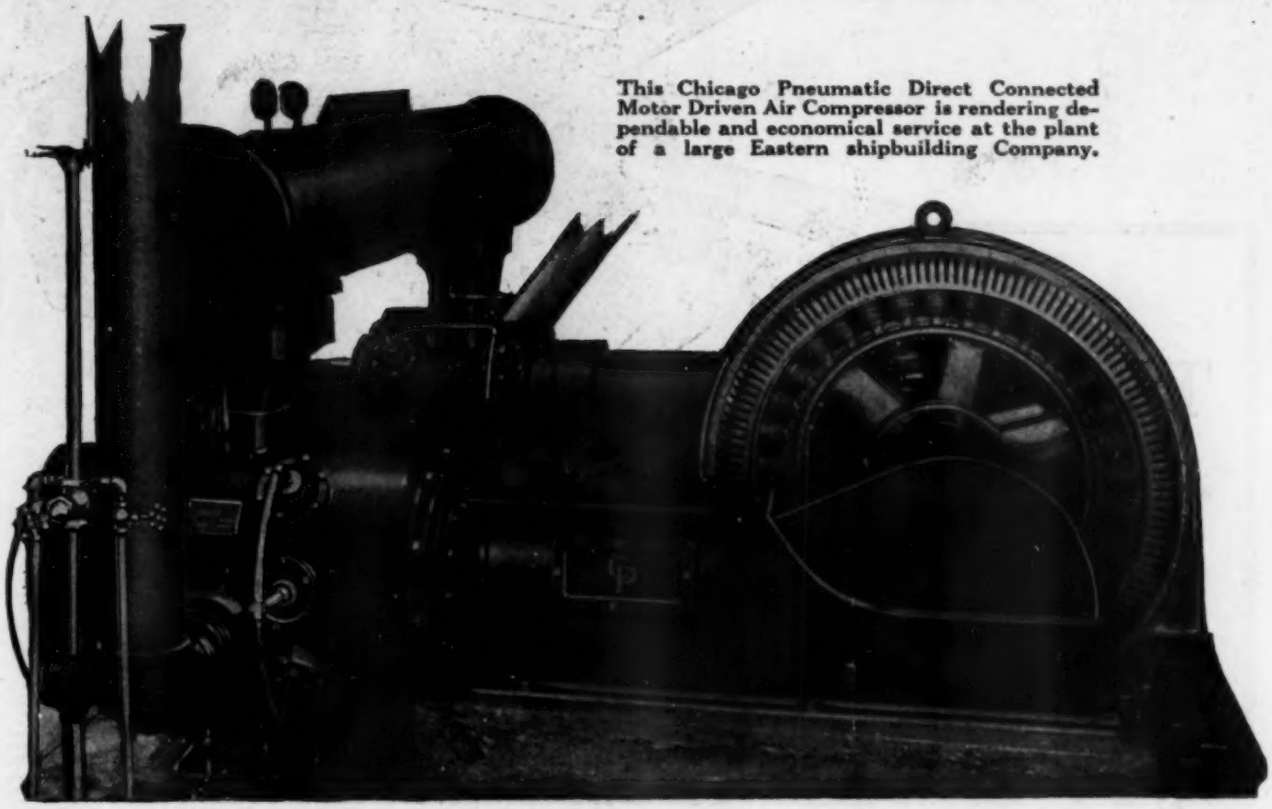

This Chicago Pneumatic Direct Connected Motor Driven Air Compressor is rendering dependable and economical service at the plant of a large Eastern shipbuilding Company.

THE air economy and operating efficiency of CP Compressors is assured by such features as Simplate Valves, automatic regulation and self lubrication.

Simplate Valves, an exclusive CP feature, with simple, flat concentric disc plates, make these compressors reliable even in a 24-hour-a-day service. With low inertia to overcome, the lift of these discs is straight and uniform affording a large effective area with small clearance; consequently they deliver the maximum volume of air with minimum power consumption.

CP portable and stationary Compressors are supplied in steam, oil, belt and direct connected motor driven types to serve every compressed air requirement.

There is a CP Compressor to meet your need. For full information write for Bulletins.

C-191

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the World

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The Vise Plays An Important Role in Production Costs

A quick-acting vise like this saves time on every job and consequently lowers manufacturing costs.

Both levers may be operated simultaneously with one hand.

The camfaced lower lever makes it possible to close the jaws quickly. The upper lever gives it the powerful grip. This is one of the most powerful vises made. Just the sort needed now. *Write us.*

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REED VISES

Cost less in the end.

No "upkeep" necessary

The design is correct for most strength and most rigidity. Send for *booklet*.

Reed Manufacturing Co., Erie, Pa.

NEW-TIP HAMMERS pay for themselves the first month

Contrast the endless chain of broken and battered "soft" hammers that are ready for the scrap heap after 30 minutes use, with Bilton NEW-TIP Hammers.

Their nicely balanced handle lasts a lifetime—only the inexpensive ends of Babbitt — Lead — Rubber — Rawhide—need replacing.

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DRILL
VISES
Drill
SPEEDERS
KNURL HOLDERS
For Turrets

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Providence, R. I.
Great Britain—Stockton & Bunn, Ltd.
France, Italy, Switzerland, Spain and Holland—Fenwick Freres & Co.

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Save
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70% Grinding
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"The Tool Holder People"
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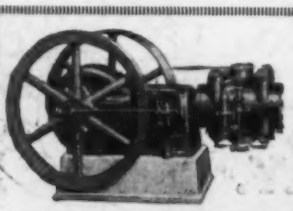

Air compressors
The "wafer" valve line
Capacity, 68-500 cu. ft.
Bulletin 770-K

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MACHINERY COMPANY
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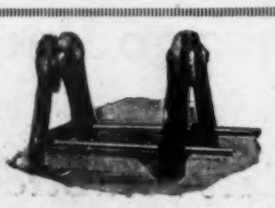

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Note the Low Introductory Prices

Large users of vises are installing DROPFO because of its greater strength—being entirely drop-forged—and because of its greater usefulness. The patented Wedgelock swivel base locks automatically when the jaws are set, or it can be locked independently.

These two features put DROPFO vises in a class by themselves. Try one the next time you need a vise.

Low Introductory Prices for Immediate Direct Orders

Size	Jaw Opening Inches	Weight, Lbs.	List Price	Introductory Prices Swivel	Introductory Prices Stat'y
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Order a DROPFO Vise Today. Stop Making Vise Replacements

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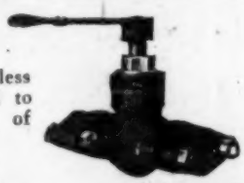
Watson-Stillman valves are designed to perform their functions with ease and safety. The materials are the best obtainable, and each valve or fitting is tested to a safe overload.



Our line embraces an almost endless number of combinations designed to meet the varied requirements of hydraulic systems.

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Just the thing for small riveting

This rotating vibratory riveter is a light bench model that will speed up your production on small riveting up to ¼ in. diameter. Easily operated by an apprentice or the most inexperienced female labor.

GRANT Riveters

are manufactured in many styles. There are **Noiseless Spinning Riveters, Multiple Spindle Riveters, Pneumatic Riveters,** and many other designs. Complete details are outlined in "Perfect Riveting." Send for your copy today.

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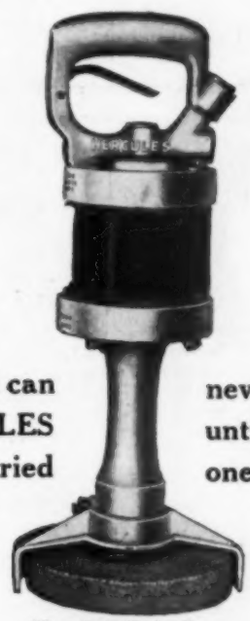
Extraordinary Torque at all Speeds

The Hercules Portable Air Grinder is an extremely fast tool. Its application is universal in its field. With it grinding wheels and buffs of many shapes may be used.

Like all units of the Buckeye line it is simple in construction — an unusually powerful tool which costs next to nothing for upkeep and is economical in operation. We will be glad to have you try out any Hercules tool in your own plant.



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No. 76 Grinder
(Patented)

Capacity ..... 6 in. by 1 in. grinding wheel.
Speed ..... 4000 R.P.M.
Weight ..... 12 lbs.

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TIREX NEVER KINKS

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TIREX
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PORTABLE CORD

will save time and money for you. It is almost wear-proof, and in service will prove to be dependable and economical.

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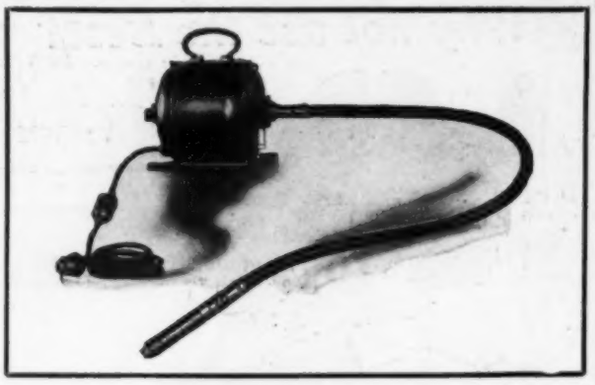

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In dozens of shops, on hundreds of jobs, these portable motor driven tools are effecting vital economies.

Slow, cumbersome, costly hand finish is accomplished in a fraction of the time by the aid of the flexible shaft.

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And for electrically operated Portable Tools, Washing and Ironing Machines; Vacuum Cleaners, Sewing Machines; Textile and Shoe Machinery from fractional horsepower to 2 or 3 horsepower; Panelboards, Appliances etc.

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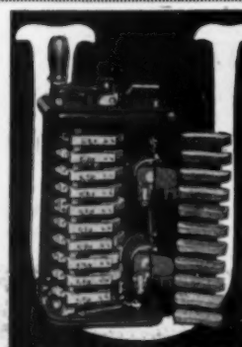

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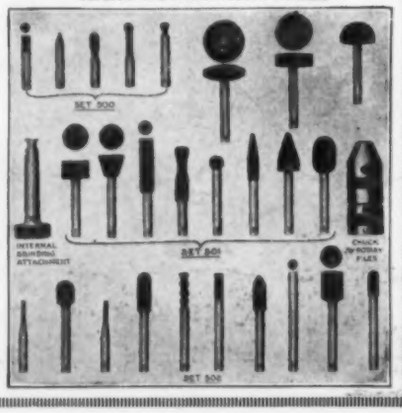

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Used with Strand Flexible Shaft Machines. Are giving excellent service.

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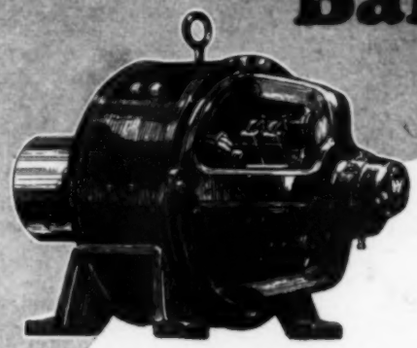
Balanced Motors for Precision Service



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Just as precision prevails in machine shop practice, so it is with Westinghouse motors. They, too, are the products of precision methods.

Take the rotor of a Westinghouse motor, for example. It is dynamically balanced to perfect precision by an exclusive method which eliminates the destructive force of vibration.

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1—Smooth, vibrationless power transmission to the machine, protecting it from undue wear.

2—Wear of motor bearings reduced to a minimum.

3—Life of motor preserved indefinitely.

4—No motor vibration to disturb the precision and accuracy of your machine tools.

Specify Westinghouse motors—**balanced** motors that mean long life and a vibrationless machine tool drive.

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Sales Offices in All Principal Cities of the
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Cut down the overhead costs of overhead shafting and belts with Westinghouse individual drive. Make each machine an independent unit.

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The demands on the standards of Efficiency are being increased in most industries. CLEVELAND OPEN SIDE PLANERS are helping to produce the economies needed in planing operations in many plants. Over 1060 in use the world over.

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26 in. to 72 in.

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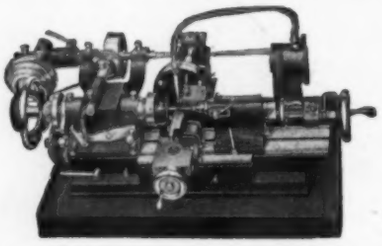

Profitable thread cutting with

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF. **Thread Millers**

These machines have a taper attachment, a compensating bar to make allowance for variation of the lead in hardening, an arrangement for obtaining multiple threads, and the means of adjusting the cutter to match threads already cut. The semi-automatic operation assures rigid duplication of interchangeable parts. For V, U.S.S., Acme, Whitworth, Buttress, and Square Threads. They will take work 7¼ in. long and up to 3 in. diameter.

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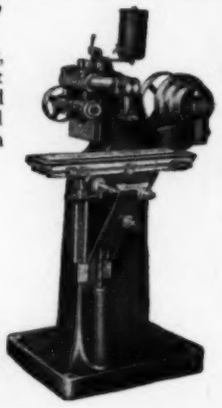
Don't make the mistake of using big, expensive milling machines on light jobs, where the U. S. Improved Hand and Weight Feed Milling Machine will give you greater and better production at infinitely lower cost.

Don't! it isn't logical. Bulletins on request.



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The United States Machine Tool Company

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Hardened steel parts need GIANT keyseating

The cutting of keyways in hubs and other parts made of hardened steel or similar tough metals, is particularly a job for the **GIANT Keyseater.** The cutter has a perfectly solid support, during the whole length of its stroke, which entirely eliminates any possibility of spring. Automatic relief on the upstroke prevents drag. This is one aspect of the **GIANT'S** superiority; the full details will be found in our catalog. Write for it.

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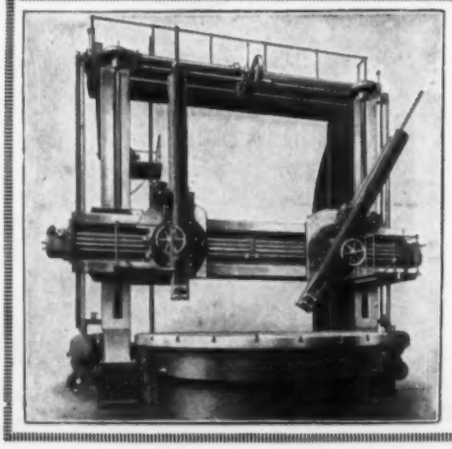

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Universally recognized for intensive production work

Which means that these versatile producers are built heavy enough to meet all the demands for a rigorous heavy duty machine, yet so extremely accurate in every direction as to satisfy the most critical on the finest tool room work.

And it is needless to say that on the four operations of Boring—Milling — Drilling — Tapping — efficiency of individual operation has not been sacrificed to gain all-around "machineability."

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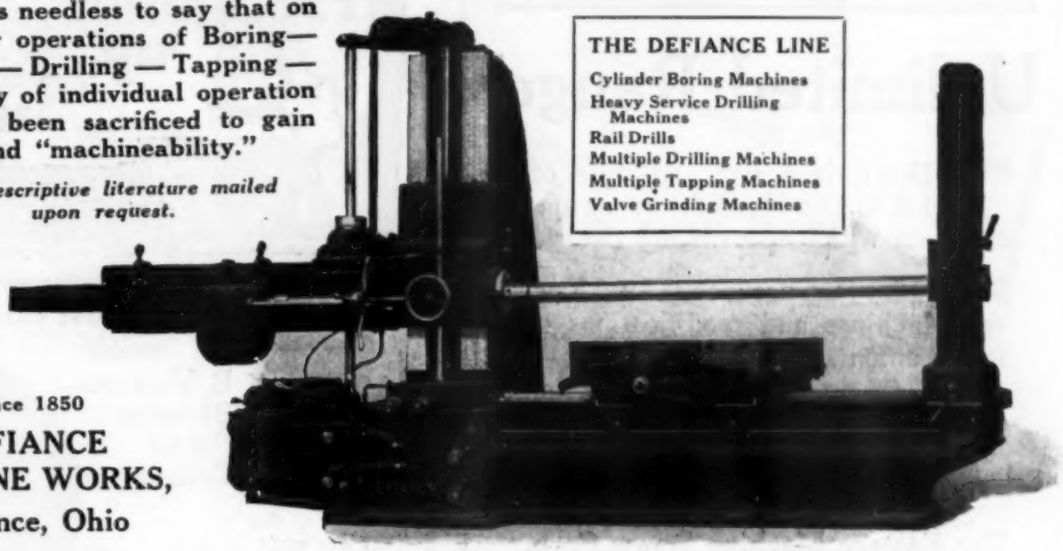

No. 6 Model Defiance 4½-in. spindle. We also manufacture smaller sizes No. 5 with a 3-in. spindle, and 5A using a 3¾-in. spindle.

Since 1850

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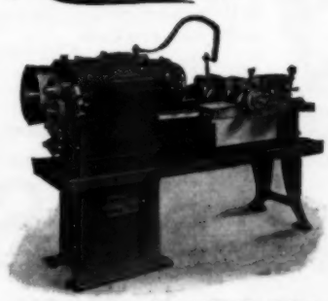
DEFIANCE BORING—MILLING—DRILLING AND TAPPING MACHINE

"Automatic" Chasing Machine



Cuts any style thread —single—double—material — up to 14-inch diameter. Full automatic operation assures speed and accuracy. No time out to grind tools.

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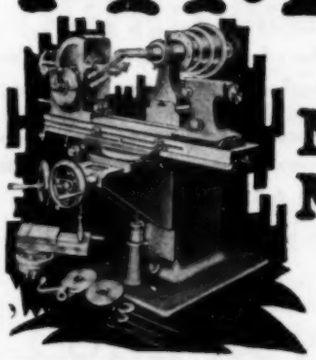

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They are made in many sizes and types to meet every requirement.

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Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. We make 14 in. Single Geared, 16 in., 20 in., 24-26 in. and 32 in. Back Geared Shapers. **Write for a Catalog.**

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Since 1887

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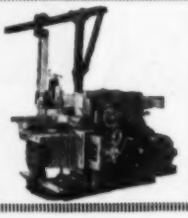

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THREAD MILLER

For milling the largest threads on a production basis.

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MAKE PROFITS

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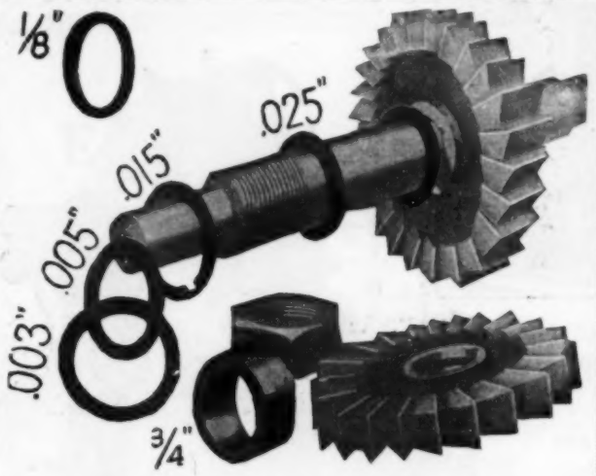

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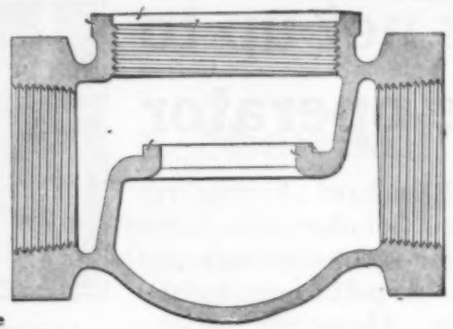

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245 per hour Goss & DE Leeuw ! Automatic Chucking Machine

Another figure for machine shop men to think over. Several of these time-savers with an hourly record such as this would have an enormous effect on your costs. One operator can run two or more machines.

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The conveniently-placed operating lever has three positions—drive, neutral, and brake.
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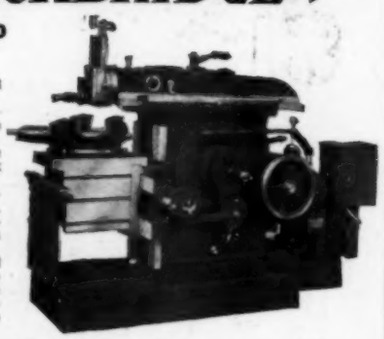

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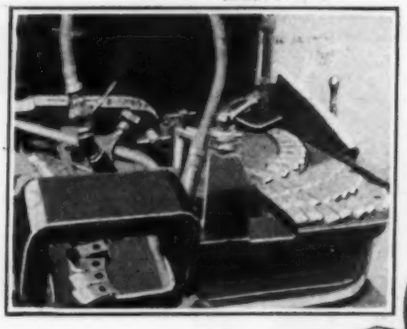

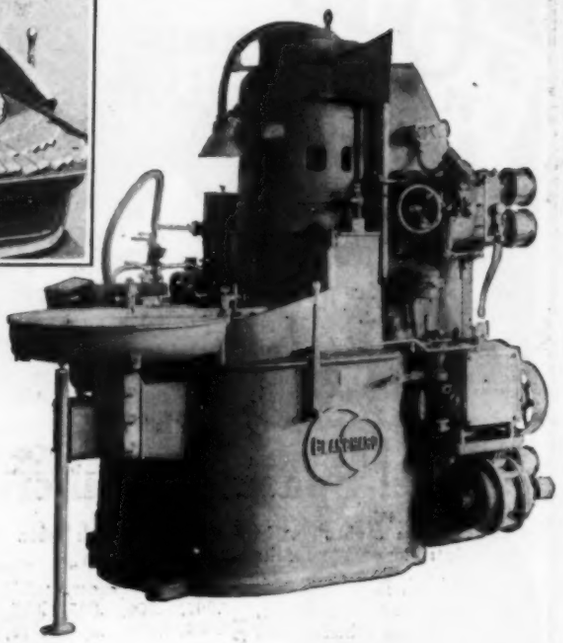

The Blanchard AUTOMATIC Surface Grinder relieves the operator of duties that can better be performed by the machine. He merely loads the work and the machine does the rest, including controlling the size of the finished pieces.

Production is high — these hardened cutters are ground on two sides, 500 per hour, parallel within .0002 in. — and spoilage is practically zero.

If you machine flat surfaces or large quantities of small pieces — either parallel sided or irregular shapes — ask us about the AUTOMATIC.

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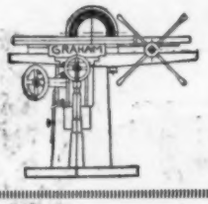

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for Flat Surfaces
NEW PULLEY GRINDER
GRINDER CHUCKS
for all machines, 10 to 30 in.
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Either Horizontal or Vertical Spindle Type
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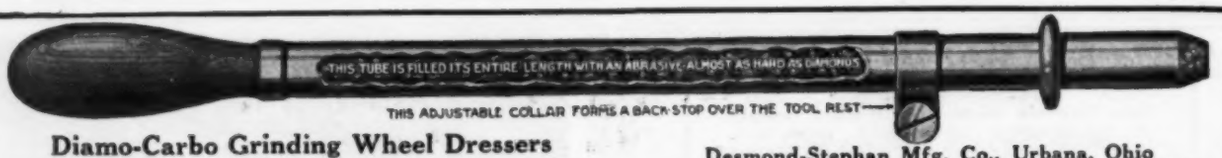
THIS TUBE IS FILLED ITS ENTIRE LENGTH WITH AN ABRASIVE ALMOST AS HARD AS DIAMONDS
THIS ADJUSTABLE COLLAR FORMS A BACK-STOP OVER THE TOOL REST

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—consist of a steel tube filled with an extremely hard abrasive. For some purposes they are as satisfactory as diamonds—at only a fraction of the cost. Try them at our expense.

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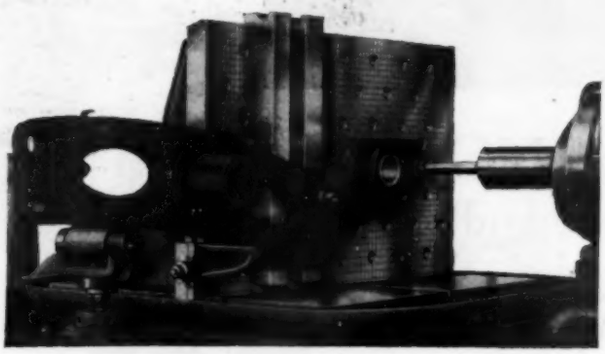

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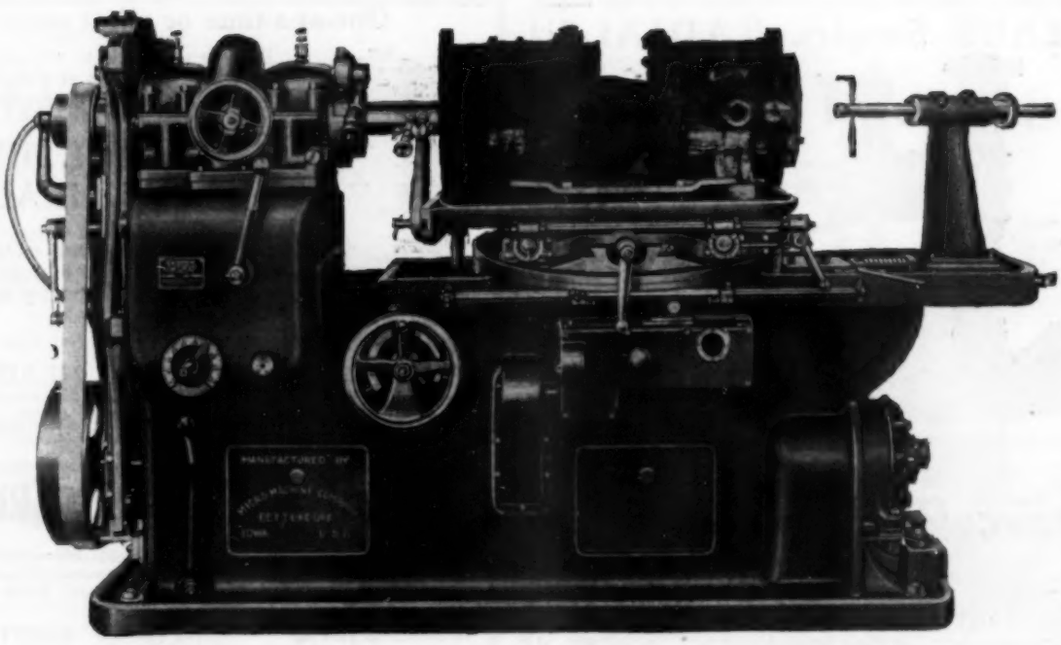
The vertical Parallel bars can be suitably spaced for any mounting.



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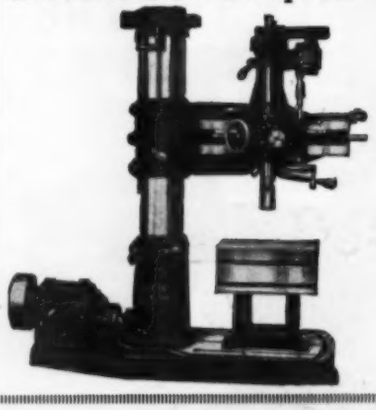

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U. S. MULTIPLE DRILL HEADS

They are built by an organization of Drill Head Specialists, with a long, thorough experience in building Multiple Drill Heads for every conceivable purpose.

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Surface Grinders, Tool and Cutter Grinders and New Yankee Drill Grinders

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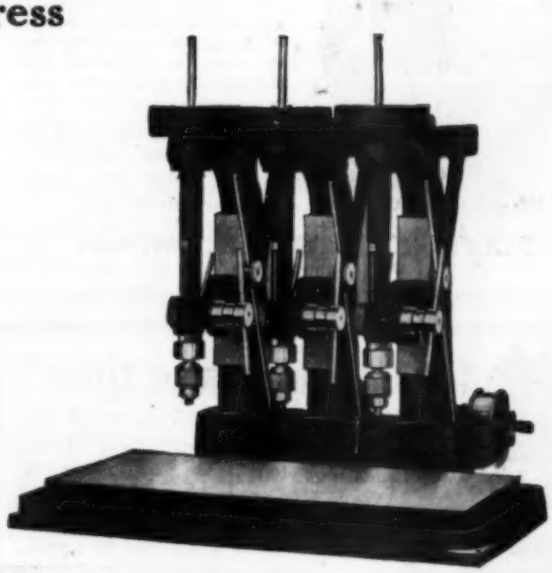
Runs as smooth as a gyroscope at 10,000 R.P.M.

Speeding 10,000 r.p.m., the spindle of a Leland-Gifford appears stationary, like the wheel of a fine gyroscope. There's no blur at the edges to tell of motion—nothing but the "cry" of the drill as it bites its way through the tough metal. That's because Leland-Gifford Drill Presses were designed and built expressly for high-speed service—3,000 to 10,000 r.p.m. is their *normal* speed. Every moving part is tested to the greatest possible perfection of running balance; all bearings and spindles are of ample size to retain their accuracy year in and year out.

You want the "last ounce," L.-G. will see you get it.



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We will be glad to be of help in the important work of laying out and tooling your machines.

The O. K. system of interchangeable tools and holder for lathes, shapers, planers and boring mills has the advantage of great saving in time. Write today for the catalogs.

Standard Lathe Set

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Made in two sizes: No. 1 with a capacity of 5 in. x 8 in., and No. 2 for bearings up to 15 in. x 15 in. Get in touch with us.

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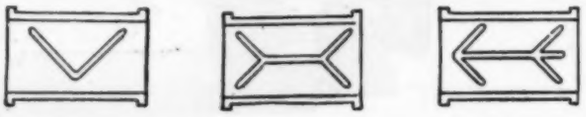

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Full steady flow up to 15 gal. per min. without danger of clogging. Anything that can enter the intake will pass through the pump. No priming trouble.

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Also Grinder and motor-driven pumping units.

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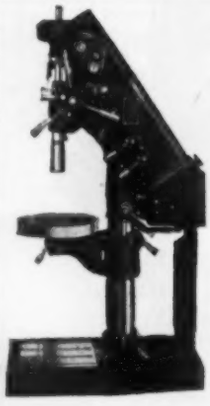

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For all makes of Multiple Drills

Due to the many exclusive features that are embodied in the design and construction of the Fox Multiple Drill Spindles a great many of our largest manufacturers have already standardized on Fox Universal Joints and Spindles regardless of the make or type of Multiple Drill that they may be using

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It will pay you to write for catalog describing our complete line of Multiple Drilling and Automatic Tapping Machines and "Superflex" Power Presses.

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Tapping Blind Holes in Air-Cooled Automobile Cylinder

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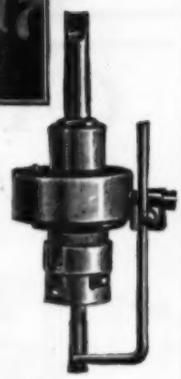

The breakage of a single tap on this job would cause an intolerable blemish in the appearance of the piece and result in heavy loss in time and money. The **Errington Sensitive Adjustment** and **Quick Reverse** insure perfect results. Regulate the power of the machine to just drive and remove all danger of breaking the tool or injuring the work. Fool proof, fits any drill press, and taps steel as safely as cast iron. Seven sizes, 3/8 in. to 2 in.

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Vertical Boring and Drilling Machines
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All Geared Head Engine Lathes

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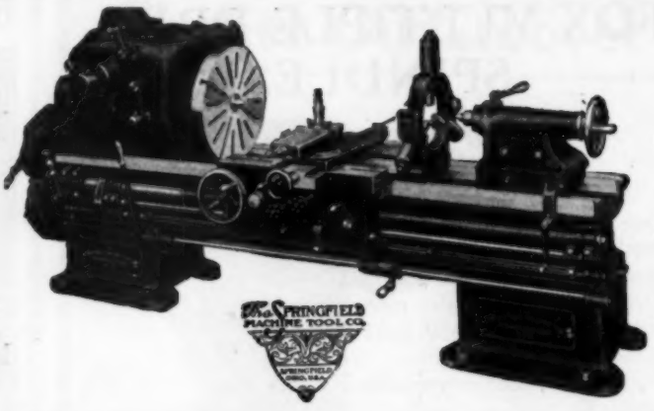
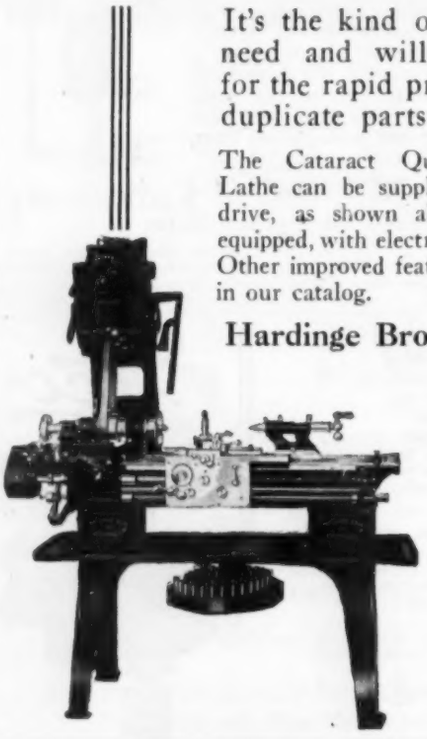


CATARACT

The quick precision lathe



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The Cataract Quick Precision Lathe can be supplied with cone drive, as shown above, or fully equipped, with electric motor drive. Other improved features are given in our catalog.

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Compact, motor-driven machines that are adapted for any place in the shop.

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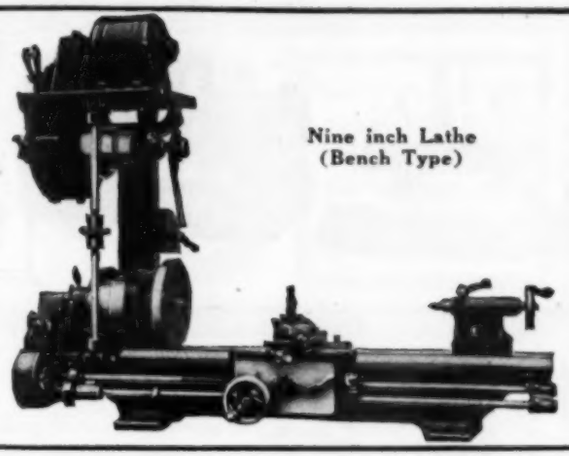

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Quantity Production reduces our costs. We pass the saving on to you.

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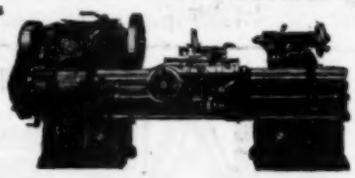

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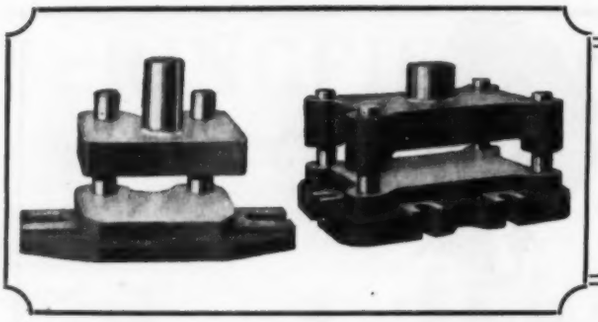

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—and no man has to wait for "Ready-Mades" either, because the centrally located agencies listed here stock the 75 standard sizes of these precision made Die Sets.

There are long designs for progressive Dies, heavy duty models with a generous amount of material to resist the heaviest strain, with a list of special Die Sets for special purposes that really come under the head of a specially-built design, but which we can supply on short notice because we have the patterns on hand.

All made of semi-steel, cast in our own foundry. Liner pins hardened and ground and fitted carefully to work with a precision smoothness.

Prices and designs gladly forwarded upon request

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Bilton Machine Tool Co.
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BILTON READY MADE DIE SETS

E-HYDRAULIC-ELMES

PRESSES & CO. PUMPS SINCE 1851

1851 **1926**

75 Years Ago
Way Back in '51

Our House Esteems the Friendship of Grandpa, Dad and Son, So Greets all Friends From '26 Way Back to '51.

With Our Best Wishes for A Happy and Prosperous New Year

Charles F. Elmes Engineering Works
HYDRAULIC AND SPECIAL MACHINERY
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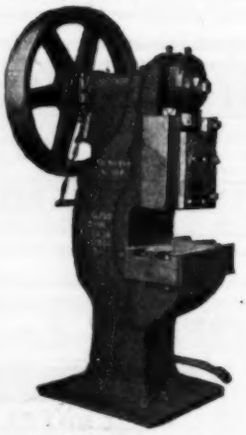
THE "TOLEDO" Punching Presses are especially suited for punching, shearing and cutting out blanks of heavy metal—steel, iron, brass, etc.; for operating trimming and forming dies used in the manufacture of automobiles, motorcycles, bicycles, cutlery, sewing machines, typewriter parts, agricultural implements, etc., switchboard parts and numerous other articles formed from bar and sheet metal.



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Estimates furnished—correspondence solicited

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Straight Side Presses
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A Bliss Automatic Press is a small factory in itself. A single machine will perform as many as 5 operations at each stroke without handling, and turns out a finished product that would ordinarily require a series of machines. This means eliminating the cost of additional machinery, operators, and floor space, and effects an economy of production that is obviously worth consideration.

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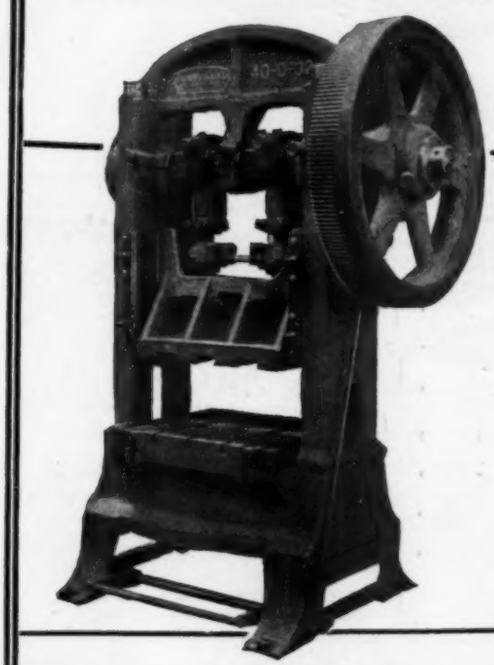

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Cleveland Presses, from the largest to the smallest, give uninterrupted **service**. This is possible because the design is right and because the right material is used in the proper place.

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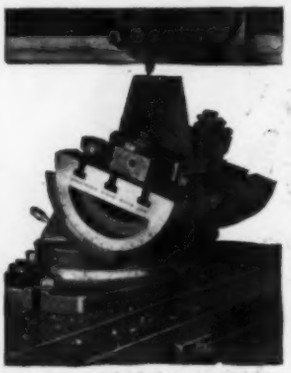
Get any angle for your planing job with

The Universal Angle Plate



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Used on all types of machines—millers, shapers, drillers, grinders, etc.

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Indispensable on Small Parts Requiring Close Precision

The quantity manufacture of small duplicate parts under ⅝ in. in diameter, necessitates the use of an accurate, speedy measuring instrument if production is to flow smoothly.

The Federal Model P Dial Indicator

was designed to meet the needs of practically every industry handling screw machine products, automobile parts, wire, watch material, screws, taps, and similar products.

By using a special convex anvil—furnished without extra charge—the *Federal* speedily tests piston rings for wall and radial thickness. Dial is graduated in .0005 in. and readings of .00025 in. can be easily taken.

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Most used in the world
For Every Phase of Heat-Treating
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will give you your accurate production. Tested 20,000 per hour

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and Smaller Machines and Tools For the Sheet Metal Shop

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Redrawing Shells **Forming Work**
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22,000 to 25,000 pieces in 9 hours

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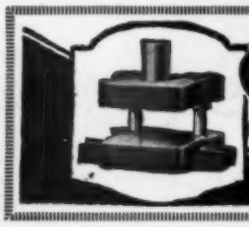

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Immediate shipments from stock.

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Presses, Dies and Sheet Metal Working Machinery

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Hydraulic Presses Entirely Self-Contained

Require small space—no separate pumping equipment or accumulator. Provide precise smooth control—rapid advance and return of ram. Reduce cost of straightening, forcing, assembling, broaching. Ask for Bulletin 30.

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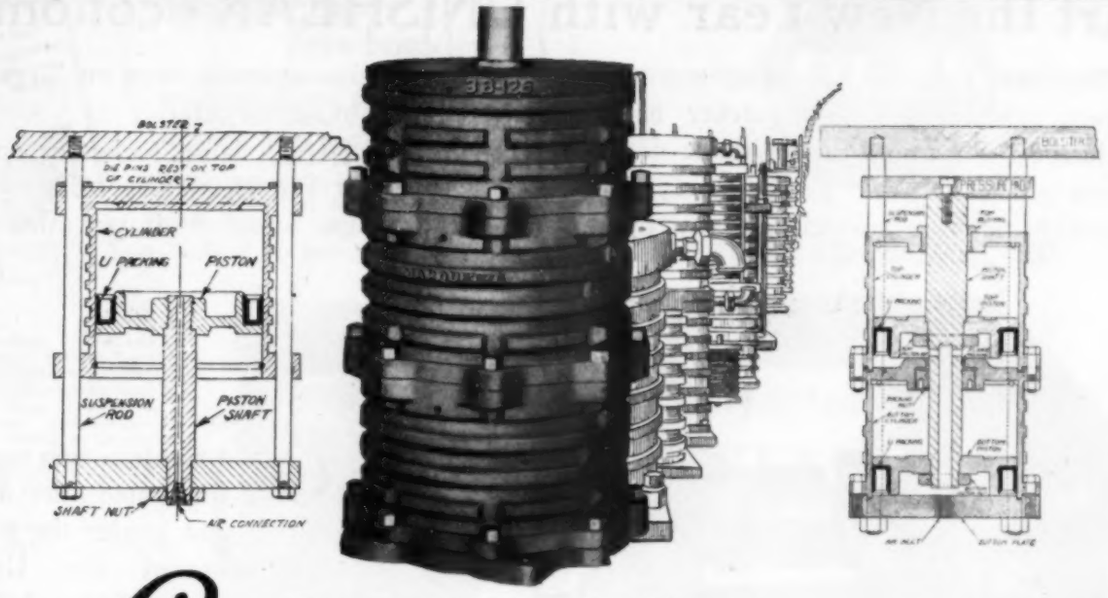

Pneumatic Die Cushions

Like High Speed Steel

Just as high speed steel, stellite, etc., brought the machine tool industry out of the stagnation of carbon steel days, and made possible new methods, new economies, and new products, so Marquette Pneumatic Die Cushions have been responsible for recent important advances in the field of power press metal drawing operations.

Work that formerly required double or triple acting presses, slow rate of production and costly, specially selected stock, can now be done with the Die Cushion's aid in one stroke of a fast single acting press, using ordinary stock metal; at the same time *getting smoother, stronger, better shells.* Combines two or more operations in one on a double acting press.

Some kinds of work which had been considered impossible to draw at all are now being drawn in one or two operations, on a quantity production basis.

The leaders in the industry are using Pneumatic Die Cushions. Others must either fall in line—or fall out.

Fortunately, there's a size and type of cushion just right for every make of press and every class of work. Why not find out what our engineers can offer that would be of help to you?

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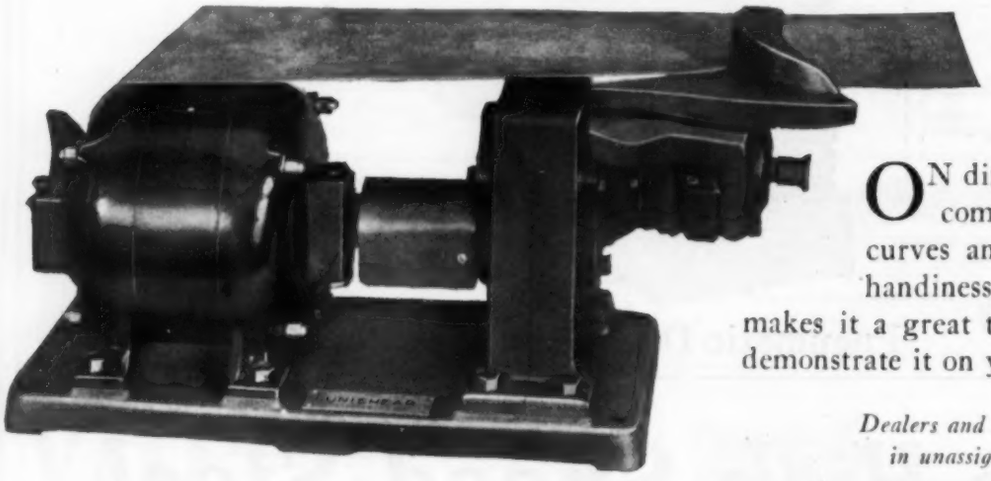
Start the New Year with UNISHEAR economies

This new machine, portable and compact, cuts any flat stock quicker, better, cheaper—without burr, without distortion of material. Follows any line exactly, stops accurately at any point. Needs but one operator even on largest work, straight or irregular.

Operates from any lamp socket or any power circuit (G. E. motor). Capacity 14 U. S. Gage. Speed, 15 ft. per minute.



ON difficult curves and most complicated lines, notches, curves and angles the extreme handiness of the Unishear makes it a great time saver. Ask us to demonstrate it on your work.

Dealers and salesmen wanted in unassigned territory.

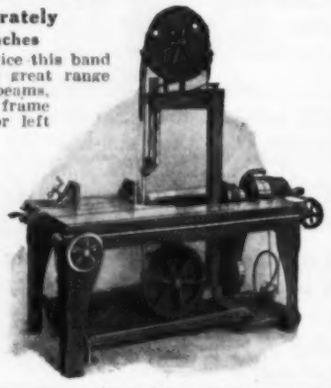
The Unishear Co., Inc., 170 Fifth Ave., New York, N. Y.

Saws Big Bars — Beams — Tubes

Rapidly and Accurately

Capacity up to 18 inches

You'll like the all-around service this band saw will render you. It has great range and big capacity. Saws bars, beams, channels, tubes, etc. Blade frame can also be tilted to right or left for cutting at an angle.



"MARVEL" No. 8

Notice the big, roomy work table.

Put this band saw to work in your plant and your metal sawing problems are solved.

Write for descriptive literature

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"The Tools in the Plaid Box"

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HACK SAWS - BAND SAWS - SCREW DRIVERS - GLASS CUTTERS

THOMPSONS THOMPSONS

Flexible band saws for metal

The Thompson band saw is hardened only to the base of the teeth. The back is kept soft and ductile to insure long life without cracking.

Details on request.

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"STERLING"—Cost Reducing Blades

DIAMOND SAW & STAMPING WORKS

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CUTTERS OF ALL KINDS
MULTIPLE SPINDLE HOBBERS
HORIZONTAL BORING, DRILLING AND MILLING MACHINES

Send for this free booklet—

If you saw metal, you'll be vitally interested in this booklet. It describes the New Peerless Universal Metal Saws that cut faster than ordinary power saws with Milling Cutter accuracy, and at the same time doubling the life of the blade.

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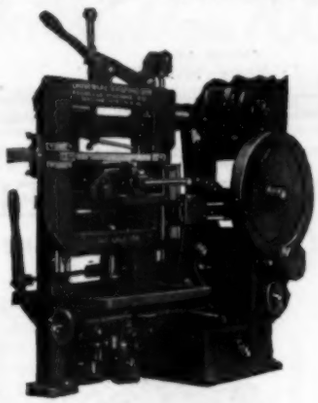
Peerless U. S. A. Power Blades have some exceptional production records back of them. Try out a dozen. Also makers of Peerless Duplex Hand Blades, and Peerless Gauging Drill Racks.



Capacities
6x6", 9x9" and 13x13"

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1615 Racine St., Racine, Wis.

Peerless HIGH SPEED
Metal Sawing Machines

Why Hamper Your Skilled Men With Obsolete Tools?

PELS

"It's use is speeding up our production and the work it turns out is satisfactory in every way"

You cannot ask more of any machine—and the machines from which you can ask as much are not legion.

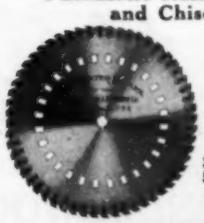
The foregoing excerpt is from a letter written by a user of a Pels Triple combined Punch, Splitting Shear and Bar, Angle and Tee Cutter. It is an unbiased expression of values—an acknowledgment of the fulfillment of every claim we made.

If you have need for a punch, a splitting shear or a Bar, Angle and Tee Cutter you need a Pels which combines all three.

The literature describing this machine will be sent to you upon request.

SAWS FOR METAL CUTTING

Inserted Tooth; Solid Tooth; Milling; Hot Pneumatic Hammer Rivet Sets and Chisel Blanks



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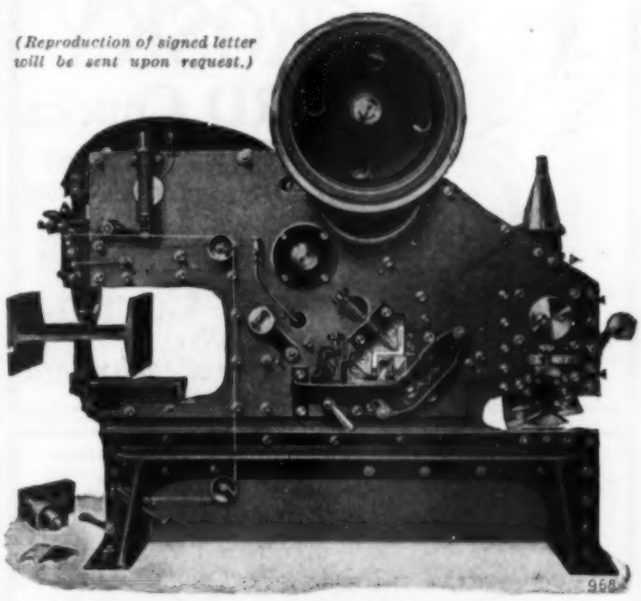
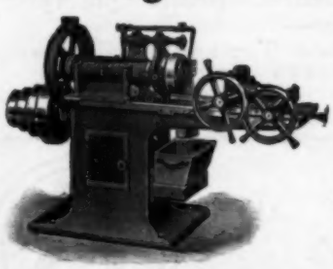
(Reproduction of signed letter will be sent upon request.)



TYPE BLUEFGA—SP.

Triple Combined Punch, Splitting Shear and Bar, Angle and Tee Cutter.

Strength and Weight



help to give Acme Bolt and Nut Machines their undoubted superiority as immediate cost reducers on all work in their capacity.

They turn out work faster than others and perfect accuracy can be depended upon. Write us for description of our entire line. Catalog?

THE ACME MACHINERY COMPANY
CLEVELAND, OHIO, U. S. A.

Henry Pels & Co.
88 West St New York

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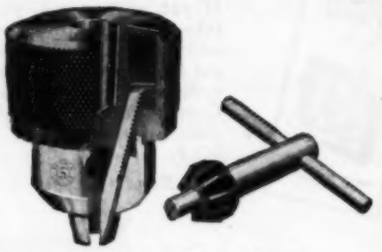
Skinner Drill Chucks eliminate most of the trouble of accurate drilling operations, simply because they are built right to hold the drill or tap accurately and rigidly on center. The hardened jaws are ground true.

They are easy to handle, too, as there are no exposed gears to pinch the fingers.

The long life of Skinner Drill Chucks is due to the great care with which they are built. Made of the best materials available for the purpose. All working parts hardened to resist wear, and of sufficient strength to rigidly hold the tool to the work.



These Drill Chucks are all described in our catalogue, which will be sent to you with prices upon request.

THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN., U. S. A.
Established 1887

New York Office: 94 Reade Street
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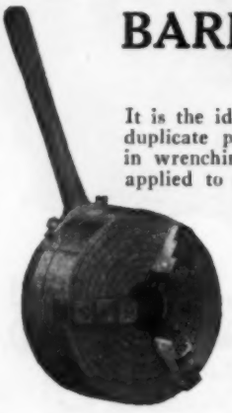
No drawback rods to reduce spindle capacity

There are no drawback rods in the makeup of the Ney Positive Grip Work Holder to reduce the capacity of the spindle for bar work. As an economical machining unit it has no peer—its six collets do the work of eighteen ordinary ones. Irregular bar stock—round or hex—is gripped without adjustment. Write for our Illustrated Folder, describing its other good points.

The J. M. Ney Co., Hartford, Conn.

BARKER
Wrenchless CHUCK



It is the ideal unit for the rapid production of duplicate parts. It eliminates all waste time in wrenching, centering, etc. It can be easily applied to any turret lathe, screw machine or semi-automatic. It gets more running time out of your machinery and cuts your labor costs.

Send for details and performance data.

Thomas Elevator Co.
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McCROSKY WIZARD Chucks
and Collets speed up drill press production
catalog on request.

McCrosky Tool Corp'n.
MEADVILLE, PA.
See our display in first issue of each month

H. B. Underwood Corp.
Established 1870 Philadelphia, Pa.

Remember this name

when engines break down!

Emergency repairs day and night—call
UNDERWOOD'S
POWER PLANT REPAIR CREW

CHUCK WITH AIR

The Lavoie Air Chucks are very simple in construction and are easy to operate. The grip is absolutely certain, as is the release. Made in seven types with six styles of jaws.

Write for particulars.

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REGISTERED TRADE-MARK

The Famous "Carpenter Quality"
Precise—Uniform—Durable
J. M. Carpenter Tap and Die Company
Oldest Tap and Die Makers in America
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Twist Drills, Reamers and Special Tools

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Universal Chucks Did It!

Drilling Jobs Increased from 700 -to 2200

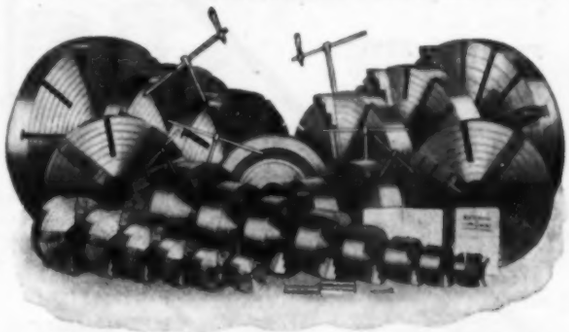
Number of Operators Reduced from 105 -to 49

And the Quality of the Work Improved

BARBER-COLMAN COMPANY

ROCKFORD, ILL., U.S.A.

WHITON
Geared Scroll Combination Chucks



These chucks are made with either iron or steel bodies and in three or four jaw types. The jaws are reversible and operate universally or independently.

LATHE AND DRILL CHUCKS

Price and dimension list on request

THE D. E. WHITON MACHINE CO.

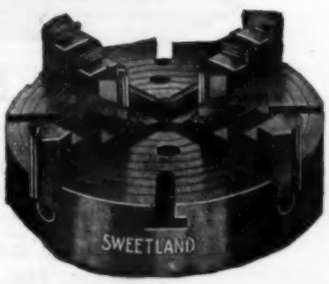
Established 1856

NEW LONDON CONN.

SWEETLAND CHUCKS

are the standard adopted by most practical men. Their uniformly high quality, together with their strength and extreme accuracy ensure a full percentage of good work; while their versatility and ease of operation permit of maximum production.

It is worth your while to send for details.



The Hoggson & Pettis Mfg. Co.

New Haven, Conn.

We Make Nothing But Chucks

Union Chucks are always "up to the minute." Our entire efforts are devoted to the development of chucks and every dollar expended in a Union assures ample returns in service. Correct design and proper materials give Union Chucks the stamina to stand hard usage.

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Makers of a Complete Line of Chucks

Our Catalog shows full line. Send for your copy.

CUSHMAN LATHE CHUCKS

"There is so much to tell about our Chucks as we build them to-day that in no less space than that of our Latest Catalog can we even approach doing justice to them.

SHALL WE SEND YOU CATALOG NO. 42?

The Cushman Chuck Company

Hartford, Conn.

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Rotary—Rectangular—Swiveling—Vertical Face

Write for full details

O. S. Walker Co., Inc., Worcester, Mass.

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For Every Lubrication Need

275 STYLES AND SIZES

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OUR WIRE WICK OILERS

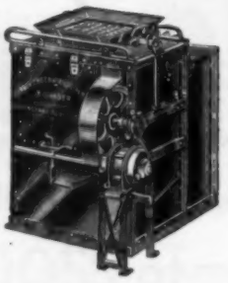
For the discriminating Executives and Engineers who want a SLOW FEEDING SYSTEM that

1. Easy to fill.
2. Assures a constant flow.
3. Cannot be clogged by dirt.
4. Needs no attention after the flow is once adjusted to conditions.
5. The cup acts as a reservoir which prolongs the flow of oil indefinitely.

GITS BROS. MANUFACTURING CO.
1943 South Kilbourne Avenue, Chicago

Your Hardening Compound Needs Mechanical Cleaning

PERFECTION Cleaner and Grader

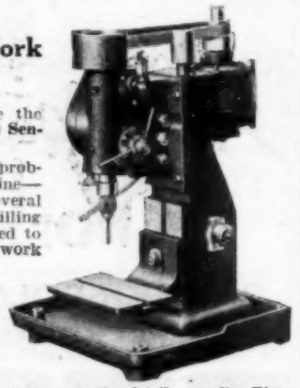


Saves Labor 75%.
Saves Compound 10 to 15%.
Mixes New and Old Compound.
Helps Prevent Soft Spots.
Eliminates Dust in Plant.

May we send full particulars?

Brown Lynch Scott Company
Manufacturers
620 S. Main St., Monmouth, Ill.

Faster Drilling—
Faster Handling of Work
—Less Drill Breakage



These are the factors that prove the superiority of **Kingsbury Automatic Sensitive Drilling Equipment.**

We offer to solve your drilling problem with more than a mere machine—with service—the result of several years' experience on small hole drilling—we see that the machine is tooled to produce as great a quantity of work with as little amount of labor as the nature of the job and desired production will warrant as regards preliminary expense.

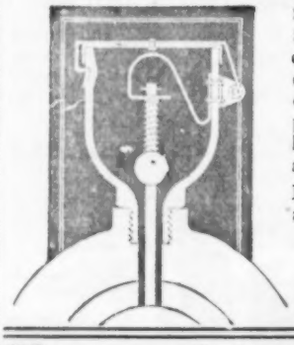
Kingsbury Mfg. Company
KEENE, N. H.

Specialists in Automatic Drilling Machinery

Write for further details regarding Kingsbury Automatic Sensitive Drilling Machines

---

A sure-fire low cost lubricating system



Simple and foolproof in design. Screw in the same as any oil cup. A patented metering pin extends on through and rests on the shaft. This agitation pumps the correct amount of lubricant *only when machine is running.*

Being widely adopted as standard equipment.

Write for Illustrated Catalog

Malcolm H. Smith Co.
Incorporated
50 Congress St., Boston, Mass.

Knorr Positive Feed Lubricator

ECONOMY

CENTER POINTS

Because: The removable point saves time in changes and enables you to carry less center stock on hands.

Manufacturing Equipment Co.
Anderson, Ind., U. S. A.

W & B MINOLARD

The Incomparable Cutting Oil

For Threading, Tamping, Milling, Drilling, Turning, Drawing, Punching, Planing and Sawing all kinds of metal

A postal brings a free sample

THE WHITE & BAGLEY CO.
Worcester, Mass., U. S. A.

BENNETT OIL HOLE COVERS

are self-closing. Dust and grit are not permitted to score the bearings. It is a simple matter to adjust one of the covers. Drill the oil hole of proper size and insert the cover by a little pressure.

It is economical, convenient and does not interfere with proper cleaning.

Our catalog M gives our full line. Write for one today.

BAY STATE STAMPING CO.
380 Chandler St., Worcester, Mass.

—Standardize your threads—
by using one make of threading tools

MURCHEY

Self-Opening Dies and Collapsible Taps
101 Varieties—All Adjustable—Write for Catalog

MURCHEY MACHINE & TOOL CO.
953 Porter St., Detroit, Mich., U. S. A.

Drills
Cutters
Reamers
Counterbores
Chucks
Mandrels
Taper Pins
Taps and Dies
Special Tools

MORSE No. 728 Adjustable Reamers

Have a wide range of expansion, from 1/16 in. in the smallest size to 5/16 in. in the largest size. Each reamer overlaps the next larger, doing away with odd sizes. Renewal blades are ground to size and can be inserted by you without difficulty. Set A to K (eleven reamers) has a cutting range from 15/32 to 1 17/32. Set A to M (thirteen reamers), 15/32 to 2 3/32.

Morse High Speed and Carbon Tools

Sold by Reliable Dealers Everywhere

MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS. U.S.A.

NATIONAL CLEVELAND
"Extra Service" Tools

Milling Cutters, Spur and Worm Gear Hobs, Reamers, Interchangeable Counterbores, Special Tools.

The National Tool Co., Cleveland, Ohio

New York, 41 Murray St.; Philadelphia, 816 Chestnut St.; Chicago, 624 Madison Terminal Bldg., 9 So. Clinton St.; Detroit, 5—116 General Motors Bldg.; Cincinnati, 141 E. 4th St.; New Orleans, La., 1810 South Dupre St.

AMES
Micrometer Dial GAUGES

A Model for every purpose

SEND FOR CATALOG

B. C. AMES CO.
Waltham, Mass.

NOBLE & WESTBROOK
Automatic Numbering Machines will prove economical

for use on all kinds of tools and instruments made of steel, brass, wood, etc. Made to order in any style or size of figures. Write for particulars.

The Noble & Westbrook Mfg. Co.
Manufacturers of Rapid Production Marking Machines, Steel Stamps and Marking Dies, Brass Checks, etc.
Hartford, Connecticut, U. S. A.

Speed up with **HŒFER** **Drilling Machines**

Their "minute-saving" features of design will greatly increase your drilling output and profits. Get the complete details from our branches in the principal cities.

HOEFER MFG. COMPANY
FREEPORT, ILL.

DIE MAKING MACHINE
"Saves an average of 50%"
"We wonder how we ever got along without it."

Dies, templets, experimental parts, gages and the like can be sawed, filed and lapped on the Oliver of Adrian Die Making Machine much easier, more accurately and in a fraction of the time ordinarily required for hand-work.

Our Bulletin tells the whole story.

Oliver Instrument Co., Adrian, Michigan.
New York City Branch, 139 Lafayette St.

The Original Hot-Forged Twist Drill

Chicago Office 18 So. Clinton St. — ***Busy Since 1874*** — New York Office 42 Murray St.

New Process Twist Drill Co., Taunton, Mass.

Any Machine Loafing in Your Plant?

PUT IT TO WORK!

Advertise your Surplus Facilities in the Market Place of the Machinery Industries — The AMERICAN MACHINIST

in the **CONTRACT WORK** *Section*

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Proposals, 40 cents a line an insertion.

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Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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1 to 3 inches.....$6.00 an inch
4 to 7 inches..... 5.50 an inch
8 to 13 inches..... 4.50 an inch
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

A.M.

POSITIONS VACANT

Indiana

DRAFTSMAN wanted, first class, experienced in designing and laying out chucks and various work holding devices to be operated by air. State fully experience, salary expected and when available for work. The Logansport Machine Co., Logansport, Indiana.

PRODUCTION man wanted, familiar with interchangeable manufacture of air operated chucks and similar devices. Also a number of high-grade machinist, turret lathe and milling machine operators. State fully experience and salary expected. The Logansport Machine Co., Logansport, Indiana.

Pennsylvania

GOOD all around die and model maker, state age, experience, wages and if married. Living much cheaper here than in the big cities. Backus Novelty Co., Smethport, Pa.

EMPLOYMENT SERVICE

IF QUALIFIED for position between $3,000 and $25,000, and desirous of considering new connection, send name and address for particulars regarding the service of the undersigned. Preliminaries negotiated confidentially, in all parts of the country and all lines. Retaining fee refunded as provided in our "Refund Contract" if service is not satisfactorily rendered as per contract, and such refund be requested within three months from date remitted. Not an employment agency. 15th year of service. R. W. Bixby, Inc., 268 Main St., (Suite 703), Buffalo, New York.

EXECUTIVES, engineers, find our individual, confidential service effective in making new connections. Personally conducted by Mr. Jacob Penn, the eminent employment authority, known to leading business men throughout America. Refund agreement protects you. Not agency. Jacob Penn, Incorporated, 305 Broadway, New York.

POSITIONS WANTED

Massachusetts

MACHINIST—Metallographist, some drafting, knowledge of design, and management. An all round man for small shop development or experimental work. Greater Boston. PW-736, American Machinist, Tenth Ave. at 36th St., New York.

PLANT engineer, age 38, 16 years in charge, plant efficiency and maintenance for large manufacturing plants. Desires similar connection or engineering assistant to executive. PW-772, American Machinist, Tenth Ave. at 36th St., New York.

New Jersey

MACHINIST-SUPERINTENDENT or similar position requiring capable executive and thorough progressive mechanic; also general maintenance experience. A-1 references. PW-761, American Machinist, Tenth Ave. at 36th St., New York.

New York

DESIGNER—Age 31. Factory trained. Tools, dies, machine tools, special machinery and sheet metal. PW-773, American Machinist, Tenth Ave. at 36th St., New York.

DESIGNING engineer, mechanical education, fifteen years designing, developing and building special and automatic machinery. Also experienced as equipment and safety engineer. PW-758, American Machinist, Tenth Ave. at 36th St., New York.

EXPORT: Machine-tool man with practical experience European and South American markets, languages, etc. Should like position in export department or similar charge. PW-774, American Machinist, Tenth Ave. at 36th St., New York.

SUPERINTENDENT desires position mechanical training. Practical tool and die maker. Age 38 with 10 years' experience as superintendent. Have wide experience in production of light and heavy machinery, also manufacturing of casting, drop forging, sheet metal work and small interchangeable parts for mechanical and electrical quantity production. Familiar with male and female labor, piece work and day work systems, also care of equipment and building upkeep. PW-746, American Machinist, Tenth Ave. at 36th St., New York.

PATENT ATTORNEYS

PATENTS, C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

We will provide modern factory and reasonable amount of capital

for manufacturer able to utilize ideally located and fully equipped foundry, machine and erecting shops. Write in detail.

BO-775, American Machinist
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Foundryman with Capital and Experience

to take full charge of ideally located and fully equipped plant. Write in detail.

P-776, American Machinist
7 So. Dearborn St., Chicago, Ill.

Well Known and Completely Equipped Manufacturing Plant

FOR SALE

Has 5 acres of land, 50,000 sq. ft. of floor space. Near center of City of Baltimore. Excellent shipping facilities, 3 R. R. spurs run into property, and is located on water. Plant equipment; heavy duty machine and steel fabricating machinery, in A No. 1 condition. Reasonable in price. Write.

Chesapeake Iron Works

Baltimore, Md.

An Opportunity to Buy a Portable Electric Tool Business

from a company who manufacture a more complete line of portable electric drills, grinders, etc., etc., than any one other concern in that line. Address,

P. O. BOX 586, CINCINNATI, OHIO

WANTED TO BUY

Fellows Gear Shaper

Must be in good condition and a bargain. Prefer No. 61 or No. 63. Give price, age, condition and all details.

W-765, American Machinist
7 South Dearborn St., Chicago, Ill.

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered.

When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. Others do not receive the slightest indication that their letters have even been received, much less given any consideration. These men often become discouraged, will not respond to future advertisements, and sometimes even question if they are bona fide.

We can guarantee that *Every Advertisement Printed in the Searchlight Section Is Duly Authorized.* Now won't **you** help keep our readers interested in this advertising by acknowledging **every** application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Searchlight Department
McGRAW-HILL CO., Inc.

"Put Yourself in the Place of the Other Fellow"

6000

Give your skilled men good tools

START the new year by checking over your shop equipment. Plan to replace old or obsolete machines with machines capable of better production. Select ReManufactured Machine Tools for the purpose. They produce like factory new, but they cost all the way from 25 to 60 per cent less. Many of the world's largest concerns use ReManufactured Machine Tools regularly. Write or wire for prices.

ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

Reg. U. S. Pat. Off.

Our guarantee is concise and unmistakable: Your money back if you return a machine within thirty days, freight prepaid. No excuses necessary.

IMMEDIATE DELIVERY

Some of our great values

For more complete list See last week's issue !

Lathes

10—19-in.x 8-ft. LeBlond.
2—19-in.x10-ft. LeBlond Univ. Turret.
12—20-in.x 8-ft. LeBlond.
2—20-22-in.x8-ft American Motor Drive.
2—20-in.x10-ft. L. & S., Pat. Hd.
5—20-in.x22-in.x12-ft. American.
5—20-in.x22-in.x16-ft. American.
1—20-in.x22-in.x24-ft. American.
20—21-in.x10-ft. LeBlond.
10—21-in.x10-ft. LeBlond Univ. Turret.
1—21-in.x12-ft. LeBlond Plain Turning.
1—24-in.x10-ft. America.
1—24-in.x10-ft. Lodge & Shipley.
12—24-in.x10-ft. Cisco.
6—24-in.x12-ft. Providence.
1—24-in.x12-ft. Reed Prentice Gd.Hd.
1—24-in.x15-ft. Chard.
26—25-ft.x10-ft. Sidney.
7—25-in.x10-ft. LeBlond.
16—25-in.x12-ft. LeBlond.
10—25-in.x10-ft. LeBlond Univ. Turret.
44—26-in.x 8-ft. Bridgeford.
83—26-in.x 9-ft. Bridgeford.
125—26-in.x10-ft. Bridgeford.
4—26-in.x10-ft. Walcott.
15—26-in.x10-ft. Whitcomb-Blaisdell.
26—26-in.x10-ft. Niles, Bement, Pond.
13—26-in.x11-ft. Wickes.
17—26-in.x12-ft. Bridgeford.
3—26-in.x12-ft. Putnam.
4—26-in.x13-ft. Wickes.
5—26-in.x14-ft. Niles, Bement, Pond.
12—26-in.x14-ft. Bridgeford-Oil Country Taper.
10—26-in.x16-ft. Bridgeford-Oil Country Taper.
2—26-in.x16-ft. Whitcomb-Blaisdell.
5—26-in.x16-ft. Niles, Bement, Pond.
2—26-in.x18-ft. Bridgeford.
4—27x30-in.x14-ft. Reed Prentice, Gd. Hd.
2—30-in.x11-ft. H. S. & G.
1—30-in.-32-in.x11-ft. American.
1—30-in.-32-in.x20-ft. American.
1—30-34-in.x11-ft. American Gd. Hd.
1—30-34-in.x12-ft. L. & S. Gd. Hd.
1—30-34-in.x20-ft. American Gd. Hd.
18—32-in.x12-ft. Pittsburgh.
1—32-in.x12-ft. Wickes.
1—32-in.x24-ft. Wickes.
1—32-in.x30-ft. Wickes.
1—34-in.x12-ft. A. S. & G.
1—36-in.x12-ft. Wickes.
2—36-in.x14-ft. Johnson.
1—36-in.x36-ft. Putnam, Geared Hd.
1—36-in.x20-ft. Pittsburgh, Gd. Hd.
1—36-in.x24-ft. Wickes.
1—36-in.x30-ft. Wickes.
1—36-in.x24-ft. Pittsburgh, Gd. Hd.
7—36-in.x30-ft. Pittsburgh, Gd. Hd.
1—36-in.x30-ft. Johnson.
4—36-in.x37-ft. N. B. P., M. D.

Lathes—Continued

2—36-in.x42-ft. LeBlond, Motor Drive.
1—36-in.x42-ft. Gisholt Gun Boring.
3—40-in.x12-ft. Fifield.
2—45-in.x24-ft. Pond.
1—33-in.-51-in.x20-ft. LeBlond.
1—33-in.-51-in.x42-ft. LeBlond.
1—60-63-in.x18-ft. Johnson, M. D.
1—60-63-in.x18-ft. Johnson, M. D.
1—60-63-in.x24-ft. Johnson, M. D.
1—60-63-in.x30-ft. Johnson, M. D.
1—56-64-in.x18-ft. Johnson, M. D.
1—56-in.-64-in.x24-ft. Johnson.
1—56-in.-64-in.x30-ft. Johnson.

Vertical Boring Mills

3—24-in. Bullard "New Era."
6—24-in. Bullard Rapid Prod.
1—42-in. Gisholt.
1—42-in. Colburn.
1—52-in. Gisholt.
1—60-in. Pittsburgh.
1—60-in. Colburn.
2—62-in. King.
2—72-in. Cincinnati.
7—72-in. Gisholt.
1—72-in. Colburn.
1—2-spndl. Hoefer Cyl. Borer.
1—84-in. King.

Millers

15—No. 6 Whitney.
50—Garragus.
22—No. 1 Van Norman.
1—No. 22 Garvin.
2—Steptoe, Hand.
24—12-in. Cincinnati.
3—24-in. Cin. Auto.

Millers—Continued

1—No. 2B Rockford Univ.
1—No. 3 Kempsmith Univ.
2—No. 2 Rockford, S.P.D.
2—No. 28 Ohio.
1—No. 1 Brown & Sharpe, Univ.
3—No. 2-B Heavy Brown & Sharpe.
9—No. 2 Kempsmith.
5—No. 3 Kempsmith.
2—No. 3 Brown & Sharpe.
1—No. 3 Heavy Brown & Sharpe.
2—No. 3 Cincinnati.
1—No. 4 Brown & Sharpe.
1—No. 4-B Heavy Brown & Sharpe.
5—No. 4 LeBlond.
6—No. 4 Cincinnati.
1—No. 5-B Heavy Brown & Sharpe.
1—No. 5 Ingersoll.
175—P. & W. Hendley, Becker and Garvin Lincoln Millers.
3—No. 33 Kempsmith.
7—Putnam Semi-Auto.
1—4-in. Pratt & Whitney Spline.
3—Pratt & Whitney Cam.

Horiz. Boring Machines

1—No. 0 Giddings & Lewis.
1—3-in. Bar Foote-Burt.
5—Rockford Traveling Head.
1—No. 35 Landis Floor Borer.
5—No. 1 Barrett.
1—4-in. Bar Newark.
1—No. 3 Beaman & Smith Engine Frame and Cylinder Borer.
1—2-spndl. Espen-Lucas Hor. Boring, Milling and Drilling Machine.
1—No. 1½ Giddings & Lewis.
1—No. 1½ Beaman & Smith.
1—5-in. Bar Detrick & Harvey.

Drill Presses, Planers

Radial Drills, Vertical

Milling Machines

Punch Presses

Turret and Screw Machines

See last week's issue.

Grinders

8—Heald Drills.
1—No. 16 Besley Disc.
1—Modern Internal.
1—No. 10-A Bryant Internal.
3—No. 20 Bryant Internal.
2—No. 70 Heald Internal.
1—No. 2 Fraser Univ.
1—No. 2 Webster & Perks Univ.
1—No. 2 Cincinnati Univ.
1—14-in. Pratt & Whitney Surf. Grinder.
1—22-in. Pratt & Whitney Surf. Grd.
1—3½-in.x36-in. Norton Cam.
2—No. 10 Brown & Sharpe.
3—6-in.x18-in. Landis.
6—6-in.x32-in. Norton.
1—10-in.x36-in. Landis.
12—10-in.x36-in. Norton.
1—10-in.x50-in. Norton.
3—10-in.x72-in. Norton.
1—10-in.x72-in. Landis.
1—10-in.x96-in. Norton.
5—12-in.x36-in. Fitchburg.
3—12-in.x36-in. Modern.
5—12-in.x36-in. Landis.
1—12-in.x120-in. Landis.
1—14-in.x48-in. Queen City.
2—14-in.x50-in. Norton.
4—14-in.x72-in. Norton.
1—16-in.x50-in. Norton.
1—18-in.x36-in.x96-in. Norton "Gap."
1—20-in.x96-in. Landis.
1—24-in.x96-in. Norton.
1—84-in. Diamond Face.

Prices on request

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HILL, CLARKE & CO. OF CHICAGO

649 W. Washington Boulevard, Chicago

Cable Address: Remand Phone Haymarket 7660

AM12-31I-RTG

New and Rebuilt High Grade Modern Machine Tools Guaranteed at Prices to Net You a Worthwhile Saving

Boring Mills
1—LANDIS No. 35 hor.
2—BULLARD, 24 in. New Era, vert.
1—GISHOLT, 48 in. vert. 2 hds.

Drills—Upright and Radial
15—ALLEN 1, 2 and 6 spindle.
13—NEW 24-in. SIBLEY upright.
4—HENRY & WRIGHT 2, 4, 5 spdle.
2—NEW TURNER No. 3 vert. turret.
2—BAKER, No. 310.
20—ROCKFORD, AURORA and BARNES, 20 in., 24 in. and 28 in.
1—MUELLER 3½-ft. Radial.
1—BAUSH 6-ft. Radial.
1—NILES-BEMENT-POND 96-in. Ridgway M.D. Pl. Radial.
5—SIPP, single spindle.

Drills—Multiple Spindle
1—NATCO No. 14.
2—NATCO No. 30 12 spindle.
2—NEW BAUSH No. 3 21 spindle.
1—NEW BAUSH No. 4 56 spindle.
1—FOX 6 spindle.
1—MOLINE 4 spindle.

Automatic Screw Machines
12—GRIDLEY 4 spindle, ⅝, 1¼, 1¾ in.
2—GRIDLEY, 4¼ in., 3¼ in. S.S.
3—GRIDLEY, 2¼, 4 spdle.
8—CLEVELAND ⅞, 1¼, 2¼ in. A.
1—CLEVELAND 7⅛ in. A.
16—B. & S. No. 2, No. 6 full auto.
1—NEW BRITAIN 1x5 Bar.
10—NEW BRITAIN No. 23, 24, 33.

Milling Machines
1—NEW ROCKFORD No. 2½ Univ.
1—BROWN & SHARPE, No. 3 Univ.
1—CINCINNATI, No. 2 Universal.
2—HENDEY No. 1 Universal.
2—ROCKFORD No. 1½; No. 2 Pl.
4—CINCINNATI No. 2, 3 and 4 Pl.
4—CINCINNATI No. 4 Pl., S.P.D.
1—B. & S. No. 13-B Plain.
4—B. & S. No. 13 Mfg.
2—TAYLOR & PENN Vertical.
1—MILWAUKEE, No. 1½-B Vertical.
3—BECKER No. 2-H, 4-B Vert.
6—BECKER No. AB, 5-C Vert.

Milling Machines (Continued)
1—CINCINNATI 48-in. Duplex.
2—NEW GARVIN No. 2 Duplex.
1—NEWTON Duplex.
9—VAN NORMAN No. ½ Duplex.
2—P. & W. 4½x12 Thread.
8—P. & W. 6x14; 6x48, 6x80 Thread.
4—LEES-BRADNER Nos. 4, 6, 8.
25—PRATT & WHITNEY No. 5 Auto.

Gear Cutters
15—BARBER-COLMAN No. 3; No. 12.
4—HERCULES 8-in.
7—B. & S. 3x36; 3x26; 4x36.
1—CINCINNATI No. 4-A, 4x48.
3—G. & E. No. 18-H.
1—G. & E. 60-in. spur.
2—G&E. S.T. 4 spdle. roughers.
20—FELLOWS, Nos. 61, 6, 615.
20—GLEASON bevel, 6 in., 11 in., 18 in.
1—LEES-BRADNER No. 5-A Gear Generator.
1—INGLE 12-in. Tooth Rounder.

Planers
7—PUTNAM 26x26x8 ft., 2 hds.
1—W. & P. 24x24x10 ft.
1—NEW CLEVELAND 36x36x8 ft.
2—GRAY 38x38x20, 3 hds., M.D.
1—PUTNAM 48x48x12 ft., 2 hds.
1—PUTNAM 48x48x30 ft., 4 hds.

Grinders
1—BLANCHARD No. 16 Surf. Belt.
1—B. & S. No. 4 Univ.
1—B. & S. No. 14 Plain.
1—SPRINGFIELD 12x12x48 Vert.
4—CINCINNATI No. 2, 12x36.
1—LANDIS 10x20 Plain.
7—NORTON 6x32, 10x36, 16x36.
1—LANDIS 18x68 Crank.
1—FITCHBURG 12x54.

Grinders (Continued)
12—BRYANT No. 20, No. 6 chucking.
2—BRYANT No. 15 dble. spdle.
28—HEALD Nos. 65, 60 and 70.
3—HEALD Nos. 255, 260.
1—VAN NORMAN No. 34.
1—DIAMOND No. 2 Surface.

Turret and Screw Machines
10—W. & S. No. 1 wire feed.
1—W. & S. No. 2-A Univ.
1—WARNER-SWASEY No. 3-A.
1—W. & S. No. 6 Univ.
4—FOSTER No. 1-B Univ.
1—NEW FOSTER No. 10 Turret.
4—GREENLEE 2¼x26-in. Turret.
4—J. & L. 2x24 and 3x36.
1—J. & L. 2-spindle Turret.
2—NEW MILHOLLAND No. 4.
5—FOSTER No. 4 Screw.
40—B. & S. No. 0, 1, 2, 6 wire feed.
1—ACME Fox Monitor.
1—W. & S. No. 6 B.G., P.F.
2—P. & W. 1x14-in. Screw.
6—POTTER & JOHNSTON No. 6-A.
6—POTTER & JOHNSTON No. 5-A.

Lathes
2—HENDEY 12x5, Yoke Head.
1—HENDEY 16x8, Yoke Head.
1—LEBLOND 14x8, Q.C.G.
5—AMERICAN 14x6, 16x8, SPD.
10—NEW SOUTH BEND 15x5, 18x8 Gap.
1—BRADFORD 16x12, Q.C.G.
2—MUELLER 18x8, Q.C.G.
1—RAHN-LARMON 18x14 ft.
1—AMERICAN 18x10 ft., Q.C.G. Spd.
1—AMERICAN 20x8-ft. cone.
1—AMERICAN 20x10-ft. Spd.
2—LEBLOND 21x12 Automobile.

Lathes (Continued)
1—LEBLOND 26x10 Univ. Crank.
3—LEBLOND 26x10 Duplex Crank.
1—BRIDGEFORD 26x12 ft. Q.C.G.
1—WALCOTT 26x14 ft. 6 in. Q.C.G.
1—LEBLOND 27x16, S.P.D.
1—GREAVES-KLUSMAN 28x10.
2—LODGE & SHIPLEY 30x16, S.P.D.
1—JOHNSON 30x12, motor drive.
2—LOSWING 3½x84, 2 carriages.
1—BRIDGEFORD 36 in. x 36 ft., raised to swing 60 in.
4—SUNSTRAND Rapid Production.
NEW STAR Lathes, all sizes, with all attachments.

Shapers and Slotters
1—NEWTON 8-in. and 10-in. Slotter.
1—P. & W. 10-in. Slotter.
6—DILL 10-12 in. and 15-18 in.

Presses
2—BLISS No. 19 geared M.D.
3—TOLEDO No. 34-P Geared.
2—TOLEDO No. 53, No. 55.
1—TOLEDO No. 857 Rack and Pinion.
25—WATERBURY-FARREL double connection 2-in. and 4-in. stroke.
2—ZEH & HAHNEMANN No. 8½ Percussion.

Miscellaneous
1—NATL. 1½-in. 2-spdle. Bolt Cutter.
LAPOINTE Broaching Machines (Hudson and New London) Nos. 1, 2, 3 and 4.
1—GARVIN 36-in. Cam Cutter.
1—BILLINGS & SPENCER 800-lb. Drop Hammer.
1—COX 3-in. Pipe Machine.
3—P. & W. No. 12 Profilers.
1—NEW QUICKWORK No. 6 Rotary Shear, 1-in. cap.
1—PELS Bar Shear.
1—PELS Univer. Shear.
1—RYERSON No. 2 Friction Saw.
3—KELLER E-3 Engravers.
1—LONG & ALLSTATTER No. 3 Punch.
1—WICKES Single End Punch.
1—CLEVELAND double End Punch & Shear, Style C.

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Knuckle Joint Embossing Presses

1—No. 5 HOWARD Gap Type, 75 tons pressure
1—No. 57S TOLEDO High Speed, Tie Rod, 150 tons pressure.
2—No. EGG 54 FERRACUTE, 400 tons pressure.
2—No. 666 TOLEDO Tie Rod, 1000 tons pressure.

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TO HELP YOU

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"Searchlight" Advertising

G-8

Planers and Boring Mills

G. A. Gray **Heavy Duty Planer,** 38 in. x 38 in. x 14 ft., two rail heads, two side heads, **Spiral Gear Drive,** with countershaft **$2,000**

G. A. Gray **Heavy Duty Planer,** 48 in. x 48 in. x 16 ft., two rail heads, two side heads, **Spiral Gear Drive,** with countershaft **2,750**

G. A. Gray **Heavy Duty Planer,** 48 in. x 72 in. x 20 ft., two rail heads, two side heads, **Spiral Gear Drive,** with countershaft **3,500**

Beaman & Smith No. 1½ **Horizontal Spindle Drilling, Tapping, Boring and Milling Machine,** with 5 T-slotted bed, 3½-in. spindle, No. 6 MT hole, with countershaft, approximate weight 22,000 lb. **1,500**

Beaman & Smith No. 10 **Horizontal Boring and Milling Machine,** 3½-in. spindle, No. 5 MT hole, continuous feed of 30 in., total feed by fleeting of 60 in., with countershaft, approximate weight, 11,000 lb. **1,200**

The above machines may be inspected at Providence, and the prices are net cash f.o.b. cars Providence.

BROWNELL MACHINERY CO.
150 Pine St., Providence, R. I.

This is the last day of the year 1925—

but not the last day to buy Good Used Equipment from us

Let us serve you throughout the New Year!

Drills

No. 1 Single Spindle Avey Ball Bearing (Toolroom).
24-in. Cincinnati geared power feed.
32-in. Cincinnati geared power feed.
2½-ft. American radial, plain.
3-ft. Cincinnati Bickford radial plain.
5-ft. Dreses radial, plain.
4-ft. Hammond Post High speed radial.
No. 30 Natco multiple spindle.
6-spindle heavy pattern Bickford, adjustable spindle rail drill.
No. 25—3-in. capacity Foote-Burt Drill, with compound table.

Millers

No. 2 Hendey universal.
No. 3 Cincinnati plain with P.F. rotary attachment.
No. 4 LeBlond plain.
No. 4 Cincinnati plain.
No. 5-B Brown & Sharpe high power, plain.

Millers—*Continued*

No. 3 and 4 Cincinnati, high power vertical.
Becker, two spindle, type A.C.S.

Boring Machines

24-in. Bullard vertical type, New Era.
30-in. King vertical type.
48-in. Colburn vertical type.
76-in. Niles vertical, 2 heads.
102-in. Poole vertical, 2 heads.
No. 2 Rockford horizontal type.
5-in. Bar Barrett horizontal cylinder type.

Turret Machines

No. 0 and No. 2 Brown & Sharpe, wire feed.
1x10-in. Pratt & Whitney, wire feed.
1½x9-in. Acme, wire feed.
24-in. Gisholt, 6¼-in. hole in spindle.

Planers and Shapers

18x18-in.x4-ft. Whitcomb planer.
30-in.x30-in.x8-ft. Whitcomb planer, second belt drive.
30x30-in.x8-ft. Cincinnati planer.
36x36-in.x10-ft. Gray planer.
72x56-in.x20-ft. Pond. 2 heads.
16-in. Cincinnati crank shaper, back geared.
20-in. American crank shaper, back geared.
20-in.x24-in. Gould & Eberhardt crank shaper, back geared.

Grinders

No. 2 Diamond surface.
No. 16 Blanchard surface.
14-in. Pratt & Whitney surface.
6x32-in. Norton, plain.
10x36-in. Norton, plain.
10x72-in. Norton, plain.
10x36-in. Cincinnati, plain.
25-in.x104-in. Landis plain.
No. 1 Brown & Sharpe universal.

See our full page list December 24th and January 7th. Write for complete specifications, photograph and price of any machine tool listed here, that interests you.

Grinders—*Continued*

No. 3 Landis universal.
No. 2 Norton cutter and tool.
No. 1 LeBlond cutter and tool.
No. 2 Walker cutter and tool.

Lathes

16-in.x 6-ft. American.
16-in.x 8-ft. LeBlond.
20-in.x 8-ft American.
24-in.x10-ft. American.
24-in.x10-ft. Lodge & Shipley.
24-in.x26-ft. Lodge & Shipley.
30-in.x12-ft. Lodge & Shipley.
38-in.x20-ft. Schumacher - Boye triple geared.
42-in.x20-ft. Bradford T. G.
42-in.x27-ft. Fitchburg. T. G.

Miscellaneous

No. 1 Baker Bros. Keyseaters.
40-Hp. W & M Gas Engine.
10-ft. Boiler Maker's Radial Drill, motor drive.
18-in.x10-in. Gould & Eberhardt hobbing automatic gear cutter.
Long & Allstatter bar iron shear.

149 Broadway **HENRY PRENTISS & COMPANY** New York, N. Y.

BOSTON BUFFALO HARTFORD ROCHESTER SYRACUSE

TO HELP YOU

LOCATE SELLING OPPORTUNITIES

"Searchlight" Advertising

G-1

SHAPERS AND PLANERS

2—15-in. Hendey, friction, nearly new.
1—16-in. Queen City (new) (bargain price).
1—16-in. Sellew (new) (bargain price).
24x24x8-ft. Chandler, ARBG, motor drive.
24x24x6-ft. Whitcomb, second belt drive.
2—16-in. G. & E. A1.
1—20-in. G. & E. A1.
12x15 Whipp, new.

IDEAL MACHINERY CO.
Plainville, Conn., U. S. A. (1)

FOR SALE

FURNACES

2—No. 35 Stewart oven furnaces. Balanced door, size of opening 14x30-in.—60-in. deep.
2—No. 8 Bellevue hardening and annealing furnaces. Muffle 28 in. wide, 48 in. deep, 20 in. high. Floor space 48x60 in.
1—Type No. 417 Rockwell die tempering furnace. Balanced door, inside dimensions 22x36x20 in. high.
1—No. 3 Stewart oven furnace, hinged left door. Size of opening 9 in. high, 15 in. wide, 24 in. deep.

Barcalo Manufacturing Co.
Buffalo, N. Y.

Rebuilt and Guaranteed

AIR COMPRESSORS

Blaisdell Steam Driven, 2 stage, 16x10 x10, self contained unit, enclosed type.
Ingersoll-Rand Type 15 single stage vertical, 4½-in.x5-in.

BORING MILLS

Bullard 24-in. "New Era" Vertical.
Bickford 96-in. Vertical, two swivel heads.
Universal No. 2½ Horizontal.

GRINDERS

Heald No. 20 Surface, magnetic chuck.
Heald No. 60 Cylinder, new type BB spindle.

LATHES

Putnam 60-in.x20-ft., triple geared, power angular feed.
Complete stock standard engine lathes, all sizes.

MILLING MACHINES

Model C Becker Vertical.
LeBlond No. 4 Plain, double back geared.
Kempsmith No. 1 Universal.
Cincinnati No. 2 Universal.
Newton 4-head adjustable rail Planer Type.

MISCELLANEOUS

5-ft. Western Radial Drill.
Pipe Machine, No. 6 Bignall & Keeler.
Stamping Press, Ferracute SN-203.
Polishing Machine, Production Type F.

PLANERS

36x36x12 Fitchburg, heavy pattern
42x48x14 American, two heads on rail and one side head.
30x30x8 Putnam.

SAWING MACHINES

Cochrane-Bly No. 2-B, takes blade 15-in.
Cochrane-Bly No. 4-B, takes blade 18-in.

SCREW MACHINES

3—9/16-in. Gridley 4 spindle Model G.
1—⅝-in.-7-in. 6-spindle New Britain.

TURRET LATHE

No. 2-B Foster Universal, with equipment.
No. 4 Warner & Swasey Universal.

And Many Others to Answer Your Needs.

LYND-FARQUHAR CO.
419 Atlantic Ave., Boston

FOR SALE

1—No. 2 Bath Universal Tool and Cutter Grinder arranged for motor drive. Machine only slightly used. Price new $2350. Any reasonable offer accepted.

Also the following:

2—18 in. x 8 ft. Hamilton Lathes.
1—18 in. x 10 ft. Hamilton Lathe.
1—No. 1 Landis Universal Grinder.
1—No. 3 Landis Universal Grinder.
1—8-in. Heald Grinder with Magnetic Chuck.
1—Chambersburg Steam Hammer.
1—No. 14 Shuster Straightener.

Textile Machine Works
Reading, Pa.

"The Best in Used Machinery"

No. 1 LaPointe Broaching Machine.
3⅛x60-in. LoSwing Lathe, 2 carriages.
No. 60 Heald Cylinder Grinder, No. 2133.
14x50-in. Norton Plain Cylinder Grinder.
4x30-in. Pratt & Whitney, Plain Cylindrical Grinder.
3 spindle Henry & Wright Drills, Type K.
2½-ft. Mueller Plain Radial, Gear Box.
3-ft. Fosdick Plain Radial Drill, Gear Box.
3-ft. Mueller Plain Radial, Gear Box.
3-ft. Reed-Prentice Radial, latest type.
4-ft. Reed-Prentice Plain Radial, M. D. (2).
7-ft. Cincinnati-Bickford Plain Radial Drills, Gear Box Drive.
18-in. Ohio B. G. Crank Shapers (2).
20-in. Kelly Back Geared Shaper.
21-in. Milwaukee Back Geared Shaper.
10-in. Betts Slotter, belt driven.
36x36-in.x10-ft. Newton Slab Miller, 2 heads

Exceptional Offering

72-in. BETTS Extra Heavy Duty Vertical Boring and Turning Mill. Spur Gear Table Drive. Has Power Rapid Traverse. All geared feeds. Table 72 in. dia. 8½ in. thick. Swings work 76 in. dia. and 4 ft. 8 in. high.

Motor Driven—Latest Type
Excellent Condition.
Weight 50,000 lbs.

No. 74½ Bliss, Straight Side Geared Press. 3-in. Stroke. Weight 10,000 lbs.
No. 8-7 Zeh & Hahnemann SS. Flywheel Presses, Wgt. 5,500 lb. each (2).
No. 5 Zeh & Hahnemann Open Back Inclinable Flywheel Press, Wgt. 2,800 lbs., 2½-in. stroke.
No. 2-M Potter & Johnson Automatic Miller.
No. 5-B Brown & Sharpe Plain Miller.
No. 3 LeBlond Plain Milling Machine.
No. 3 Becker Vertical Miller.
No. 2-B Brown & Sharpe Plain Miller.
No. 2 Pratt & Whitney Vertical Die Sinker.
24-in. Brown & Sharpe Gear Cutter.
37-in. Baush Vertical Boring Mill.
42-in. Bullard Rapid Pro. Vert. Bor. Mill, M.Dr.
42-in. Bullard Vertical Boring Mills (2).
51-in. Bullard Vertical Boring Mill.
17-in.x 6-ft. LeBlond Rapid Prod. Lathes (4).
24-in.x14-ft. Reed-Prentice Grd. Hd. Lathes (2).
25-in.x12-ft. LeBlond Q. C. G. Lathes (7).
32-in.x20-ft. Bahn Carpenter Engine Lathe.
46-in.x16-ft. New Haven Engine Lathe.
40-lb. Bradley Helve Hammer.
60-lb. Rochester H. D. Helve Hammer.
400-lb. Beaudry Upright Power Hammer.
1,000-lb. Billings & Spencer Board Drop Hammer.
1,100-lb. N-B-P Steam Forging Hammer.
Miner & Peck Drop Presses, 600 lbs. (4).
4-in., 6-in., 8-in. and 12-in. Pipe Threading Machines.

Send for our 64-page DECEMBER Illustrated Stock Booklet of Machinery Bargains.

WICKES MACHINERY CO.
F. H. NILES & CO., Inc.
Claremont and West Side Avenues,
Jersey City, N. J.
"Satisfaction Guaranteed or Money Refunded"
Established 1900

At a Private Plant

We are selling out the equipment of a large local plant. Modern Machinery — much of it practically new. Priced way below the market, for quick sale. Must be sold at once. Here is a partial list.

AUTOMATIC SCREW MACHINES

5—No. 0 Brown & Sharpe Full Automatics serials 3000.
8—No. 0 Brown & Sharpe Turret Formers serials 4000.
7—No. 2 Brown & Sharpe Full Automatics serials 4000.
3—No. 2 Brown & Sharpe Cut Offs serials 4200.
1—No. 0G Brown & Sharpe Full Automatic serials 4437.
2—New Britain size 3, 6-spindle Automatic Chucking Machines.
1—1-inch New Britain 6-spindle Automatic Chucking Machine.
3—1⅝x7-in. New Britain 6-spindle Full Automatics.

GEAR CUTTERS

7—Waltham Worm Gear Milling Machines.
10—Waltham Automatic Bench Pinion and Gear Cutting Machines.
4—No. 6½ Bilton Automatic Milling and Gear Cutting Machines.
2—No. 2½ Bilton Automatic Milling and Gear Cutting Machines.
1—No. 3½ Bilton Automatic Milling and Gear Cutting Machine.

GRINDERS

7—No. 1 Brown & Sharpe Universal Grinding Machines, with equipment.
1—No. 1½ Cincinnati Universal Cutter Grinder.

DRILLS

3—No. 11 Natco Adjustable Multiple Spindle Drill Presses, 8-spindle and 12-spindle heads.
2—No. 12 Natco Adjustable Multiple Spindle Drill Presses.
1—Henry & Wright 2-spindle 24-inch Ball Bearing High Speed Drill.
2—Henry & Wright Single Spindle 16-inch Ball Bearing High Speed Drill.

HAMMERS

1—12-inch Bliss 4-poppet Drop Hammer.
1—24-inch Bliss 4-poppet Drop Hammer.
2—Bliss 600 pounds Forging Board Drop Hammers, patent lifters.

MISCELLANEOUS

1—26-in.x8-ft. Gray Single Head Planer.
1—No. 7 American Gas Furnace 3x4½x5 ft.
1—16-in. Hendey Shaper.
1—Groton Vertical Engraving Machine.
1—24-in. American Oil Separator.

Also a large quantity of other equipment including, presses, millers, turret lathes, buffing machines, small tools, etc.

A real opportunity for you. Wire us at once.

LUCAS MACHINERY SERVICE
J. L. LUCAS & SON Inc
BRIDGEPORT, CONN.

Good Tools at Worthwhile Savings

All of the machines listed here are in stock and ready for immediate shipment. Where rebuilding was found to be necessary, this has been done in our own shops under expert supervision. See us before you buy—and you'll be sure of a bargain.

No. 12 Barber-Colman **Gear Hobber.**
36-in. Cincinnati **Gear Cutter.**
32-in. Superior **Sliding Head Drill.**
10x52-in. Landis **Plain Cylindrical Grinder.**
12x24-in. Modern **Plain Cylindrical Grinder.**
No. 3 Brown & Sharpe **Universal Grinder.**
17-in.x6-ft. LeBlonde **Rapid Production Lathe.**
18-in.x8-ft. Walcott **Engine Lathe.**
9x36-in. **Monarch Junior.**
No. 0 Bristol Ball Bearing **Hand Miller.**
3—Grant Two-motor **Rivet Spinners.**
6-in. Hermance **Chain Feed Rip Saw.**

All Practically New

Richey-Whaley Machinery Company
23-25 E. South St., Indianapolis, Ind.

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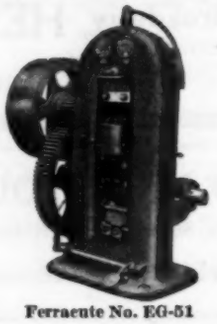

Ferracute No. EG-51

75 tons capacity, weight 4100 lb., 1-in. stroke, width between columns 10-in., area of bed 7⅓ x 14½-in., bed equipped with automatic sliding feed. Condition ALMOST NEW.

J. N. MOYER
117 N. 3rd St., Philadelphia, Pa.

"Opportunity" Advertising:

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0100

FOR SALE BY
The Akron Equipment Co.
Akron, Ohio

Automatics, Gridley 4-spindle, 1¼ in. cap., serials 2695 and 2070, (2), each	$900
Automatic, National Acme 4-spindle, 1¼ in. capacity, serial 9201	750
Grinder, National Acme 6 in. x 22 in. automatic surface	60
Lathe, 13 in. x 6 ft. Fitchburg, not screw cutting	70
Screw machine, hand, 1 in. Leisy-Patlon. Fine condition	190
Threading machine, National Acme 2-spindle, 1 in. capacity	125

Power Equipment

2—75 hp. Hewes & Phillips Corliss Engines.

1—Engine Generator Set, 40 kw., 120 v. D.C.

1—Crocker-Wheeler Motor, 50 hp., 220 v., 2 ph., 60 cy.

Morris Machinery Co., Inc.
Newark, N. J.

Notice to Advertisers

Owing to the holiday — New Years' Day, Friday, Jan. 1st— the "Searchlight" pages of the Jan. 7th issue of

American Machinist

will close for press a day earlier than usual.

Changes of Copy

and new advertisements, including those under the Employment classifications, should therefore reach us

10 A.M. Wednesday, Dec. 30th
for the issue of Jan. 7th

Look over this partial list *of Used Machine Tools*

[Then send for the booklet giving full details—there are many real good buys listed in it.]

Planers

30x30-in.x 6-ft. Pond, 2 heads.
30x30-in.x 8-ft. Pond, 2 heads, rev. motor.
30x30-in.x12-ft. Pond, 2 heads, rev. motor.
32x32-in.x10-ft. Niles, 2 heads.
36x36-in.x10-ft. Niles, 4 heads.
36x36-in.x12-ft. Pond, 4 heads, rev. motor.
36x36-in.x16-ft. Pond, 4 heads, rev. motor.
38x38-in.x10-ft. Niles, 2 heads.
42x42-in.x12-ft. Niles, 4 heads.
42x42-in.x14-ft. Pond, 3 heads.
42x42-in.x26-ft. Pond, 4 heads, rev. motor.
48x48-in.x16-ft. Pond, 4 heads, rev. motor.
50x36-in.x22-ft. Pond, 4 heads, rev. motor.
52x36-in.x10-ft. Pond, 4 heads, rev. motor.
54x54-in.x22-ft. Pond, 4 heads, rev. motor.
60x60-in.x20-ft. Niles, 3 heads.
60x60-in.x24-ft. Niles, 4 heads.
96x72-in.x42-ft. Pond, 4 heads, rev. motor.
10x10-46-ft. Pond, 4 heads, rev. motor.
120x120-in.x36-ft. Betts, 4 heads, motor drive thru belts.

Milling Machines

No. 2 Cin. Univ., motor driven.
No. 4 LeBlond, Univ., motor driven.
No. 3 Brown & Sharpe Plain Miller, motor driven.
No. 4 Brown & Sharpe Plain Miller.
No. 5 Brown & Sharpe Plain Miller.
48x48-in. 4 hds. Bement Miller, motor driven.
No. 5 Brown & Sharpe Vertical Miller.
6x 48-in. Pratt & Whitney Thread Miller.
6x 80-in. Pratt & Whitney Thread Miller.
6x132-in. Pratt & Whitney Thread Miller.

Drills

32-in. Bement Drill.
3½-ft. Morris Radial Drill.
5-ft. Ridgway Radial Drill, motor driven.
6-ft. Pond Radial Drill, motor driven.
6-ft. Niles Semi Universal Radial Drill, motor driven.
6-ft. Niles Universal Radial Drill, motor driven.
8-ft. Pond Radial Drill, motor driven.

Vertical Boring Machines

36-44-in. Niles Side Head Mill, motor driven.
10-ft. Niles Boring and Turning Mill, motor driven.

Gear Cutters

No. 3 Brown & Sharpe Spur Gear Cutter.
No. 4 Brown & Sharpe Spur Gear Cutter.
24-in. Gleason Bevel Gear Cutter.
54-in. Gleason Bevel Gear Cutter.
No. 5A Lees Bradner Gear Hobbing Machine.
36x14-in. G. & E. Hobbing Machine.

Shapers and Slotters

16-in. Stockbridge Shaper.
26-in. Worcester Crank Shaper.
15-in. Bement Slotter, motor driven.
18-in. Bement Slotter, motor driven.

Lathes

16-in.x 6-ft. Morris Lathe.
16-in.x 8-ft. Morris Lathe.
18-in.x 8-ft. Morris Lathe.
18-in.x10-ft. Morris Lathe.
21-in.x 8-ft. Le Blond Lathe, motor driven.
22-in.x10-ft. Morris Lathe.
22-in.x20-ft. Morris Lathe.
25-in.x10-ft. Le Blond Lathe, motor driven.
26-in.x10-ft. Pond Lathe, motor driven.
26-in.x36-ft. Pond Quick Change Lathe, dble. back gd.
30-in.x14-ft. Pond Quick Change Lathe, M. D.
30-in.x23-ft. Pond Quick Change Lathe, dble. back gd.
36-in.x12-ft. Pond Triple Geared Lathe, motor driven.
36-in.x17-ft. Pond Triple Geared Lathe, motor driven.
36-in.x25-ft. Pond Dbl. Back Geared Lathe.
42-in. Pond Forge Lathe, motor driven.
48-in.x24-ft. Pond, motor driven.
60-in.x26-ft. Niles Lathe.
72-in.x21-ft. Pond Lathe, motor driven.
2½x26-in. Pratt & Whitney Turret Lathe.
3x36-in. Pratt & Whitney Turret Lathe.
21-in. Pond Rigid Turret Lathe.
25-in. LeBlond Turret Lathe.
28-in. Pond Rigid Turret Lathe.

Horizontal Boring Machines

40-in. Morris Horizontal Boring and Drilling Machine, 2-in. bar.
60-in. Bement Hor. Boring and Drilling, 2⅞-in. bar.
66-in. Bement Hor. Boring and Milling, 4½-in. bar.
80-in. Bement Hor. Boring and Drilling, 5½-in. bar, motor driven.
60-in. Bement Duplex Control Boring, 4-in. bar, motor driven.
Pond Floor Drill, 3-in. bar.
Niles Boring, Drilling and Milling, 5-in. bar, motor driven.

Miscellaneous Machines

2-in. Cox Pipe Machine, motor driven.
No. 3 Long & Allstatter Hor. Punch, ⅞-in. in ⅞-in.
No. 2 Long & Allstatter Punch, 48-in. Throat 1 in. in 1-in.
No. D Long & Allstatter Double Machine. 36-in. Throat. 3-in. in 1¾-in.

Cranes and Hoists

Electric Traveling Cranes, 220 V. D.C.

3-ton, 10-ton and 25-ton.

NOTE!—All Motor-Driven Machines are for 220 volts, Direct Current.

Motors

We have a large stock of new motors from 1 hp. to 50 hp. which are of the variable speed type, 220 volts D.C., which we offer at attractive prices.

NILES-BEMENT-POND CO.

General Offices—111 Broadway, New York, N. Y.

Birmingham, 2015 First Ave.
Boston, 125 Purchase St.
Chicago, 33 South Jefferson St.
Cincinnati, 338 West Fourth St.
Cleveland, 730 Superior Ave., N.W.
Detroit, 5936 Cass Ave.
Los Angeles, 454 East Third St.
Philadelphia, 405 N. 21st St.
Philadelphia, 2415 Chestnut St.
Rochester, 552 East Main St.
St. Louis, 516 North Third St.
San Francisco, 917 Howard St.
London, 25 Victoria St., S. W.
John Bertram & Sons Company, Dundas, Ontario, Canada.

Guaranteed Condition

Used Machine Tools

2—No. 0 B & S Automatics.
2—2¼-in. Gridley 4 Spindle Automatics.
6—⅝-in. Gridley 4 Spindle Automatics.
3—2-in. Cleveland Automatics.
6—2¼-in. Gridley 1 Spindle Automatics.
1—⅞-in. Cleveland 1 Spindle.
1—1⅝-in.x7 New Britain Automatic.
2—3¼-in. Gridley 1 Spindle Automatics.
2—24-in. Rapid Production Bullards.
1—34-in. Vertical Turret Lathe.
1—36-in. Vertical Turret Lathe, Side Hd.
1—37-in. Bullard Vertical Boring.
2—42-in. Bullard Vertical Boring.
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2—No. 2 Rockford Horizontal 3-in. bar.
1—No. 2 Rochester Horizontal 3-in. bar.
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4—No. 2-D Moline, 4 Spindle.
1—8 Spindle Bausch 30-in. Circle.
2—No. 37 Natco Multi. Drill.
3—No. 41 Nat'o Multi. Drill.
2—60-in. American Radial, Triple Geared.
1—72-in. Bickford Radial Drill.
1—No. 4 Gardner Grinder, Ball Brg.
2—No. 6 and No. 7 Gardner.
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1—10x50 Norton Plain Grinder.
1—14x36 Norton Plain Grinder.
4—14x50 Norton Plain Grinders.
2—14x72 Norton Plain Grinders.
1—14x96 Norton Plain Grinder.
1—No. 60 Heald Cylinder Grinder.
1—24x32-in. 10-ft. Norton Plain.
1—No. 2 Formed Cutter Grinder.
1—Ingersoll Face Cutter Grinder, 24 in.
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2—16x6 Hendey Tool Room.
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2—17x8 LeBlond Motor Drive.
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1—48x32 Bridgeford all geared.
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1—50x31 Putnam Motor Drive.
1—54x34 Bement Heavy Cone.
1—60x35 Bement Heavy Cone.
1—72x56 N.B.P. Motor Drive.
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1—No. 4 Cincinnati H P Vertical.
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Pawtucket (R. I.) Mfg. Co.

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Cincinnati (O.) Planer Co.
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Sellers & Co., Wm., Philadelphia

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Consolidated Machine Tool Corp., Rochester
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Lucas Machine Tool Co., Cleveland
Moline (Ill.) Tool Co.
Murchey Mach. & Tool Co., Detroit
Niles-Bement-Pond, N. Y.
Rockford (Ill.) Drilling Mach. Co.
Ryerson & Son, Jos. T., Chicago
Sellers & Co., Wm., Philadelphia.
Sommers & Adams Co., Cleveland
Springfield (O.) Mch. T. Co.
Universal Bor. Mch. Co., Hudson, Mass.

Boring, Drilling and Milling Machines, Vertical
Cons. Mach. Tool Corp., Rochester
Defiance (Ohio) Mach. Wks.
Knight Mchy. Co., W. B., St. Louis

Boring Tools
Armstrong Bros. Tool Co., Chicago

Boxes, Tote (See Furniture, Machine Shop)

Brackets, Lamp Adjustable
McCrosky Tool Corp., Meadville, Pa.

Brake Lining
Raybestos Co., Bridgeport

Brass Rods
Bridgeport (Conn.) Brass Co.

Brass, Sheet
Bridgeport (Conn.) Brass Co.

Brass, Tube
Bridgeport (Conn.) Brass Co.

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Link-Belt Co., Chicago-Philadelphia

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Johnson Gas Appliance Co., Cedar Rapids, Iowa

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Cabinets, Tool, Reamer & Drill, Steel (See Furniture, Machine Shop)

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Starrett Co., L. S., Athol, Mass.

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Rowbottom Mach. Co., Waterbury

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American Gas Furnace Co., Elizabeth

Carburizing Compound Cleaners
Brown Lynch Scott Co., Monmouth, Ill.

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Meisel Press Mfg. Co., Boston
Shore Instrument & Mfg. Co., Jamaica, N. Y.

Castings, Aluminum
Bunting Brass & Bronze Co., Toledo
Franklin Die Casting Corp., Syracuse
Stewart Mfg. Co., Chicago

Castings, Brass, Bronze and Copper
Bunting Brass & Bronze Co., Toledo
Imperial Brass Mfg. Co., Chicago.
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Franklin Die Cast. Corp., Syracuse.
General Die Casting Co., Reading
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Whiton Mach. Co., D. E., New London

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Cincinnati (O.) Planer Co.

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Boston Gear Wks., Quincy, Mass.
Link-Belt Co., Chicago-Phila.
Morse Chain Co., Ithaca
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Ramsay Chain Co., Albany
Whitney Mfg. Co., Hartford

Chamfering Machines, Automatic
Grant Mfg. & Mach. Co., Bridgeport

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Brown & Sharpe Mfg. Co., Providence
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Jones & Lamson Mach. Co., Springfield, Vt.
New Britain (Conn.) Machine Co.
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Warner & Swasey Co., Cleveland

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Frontier Chuck & Tool Co., Buffalo

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Thomas Elevator Co., Chicago

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Armstrong Bros. Tool Co., Chicago
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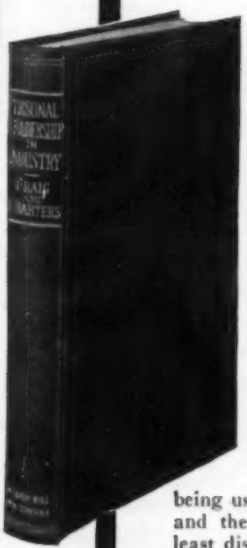

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Engineers, Industrial & Mechanical
Hartford (Conn.) Special Mchy. Co.
Underwood Corp., H. B., Phila.

Engines, Oil, Gas & Steam
Chicago Pneumatic Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.

Engraving Machinery
Gorton Mach. Co., Geo., Racine.
Keller Mech. Eng. Co., Brooklyn
Preis & Co., H. P., Newark, N. J.

Expanders, Tube
Watson-Stillman Co., N. Y.

Eyeglasses, Safety (See Goggles, Safety)

Fans, Electric
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Fans, Exhaust
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Fans, Ventilating
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Files and Rasps
American Swiss File & Tool Co., Elizabeth, N. J.

Filing Machines
Ames Co., B. C., Waltham
Haskins Co., R. G., Chicago
Oliver Instrument Co., Adrian
White Mfg. Co., S. S., N. Y.

Filler, Iron (See Cements, Iron)

Fittings, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Flanging Machines, Tube
Grant Mfg. & Mach. Co., Bridgeport

Forging Machinery
Acme Mchy. Co., Cleveland
National Mchy. Co., Tiffin

Forgings, Drop
Bearings Co. of America, Lancaster, Pa.
Storms Drop Forging Co., Springfield, Mass.

Fuel Oil Burning Systems
Chicago (Ill.) Flexible Shaft Co.

Furnaces, Forging
American Gas Furnace Co., Elizabeth
Chicago (Ill.) Flexible Shaft Co.

Furnaces, Heat Treating, Oil and Gas
American Gas Furnace Co., Elizabeth
Brown & Sharpe Mfg. Co., Providence
Chicago (Ill.) Flexible Shaft Co.
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Strong, Carlisle & Hammond Co., Cleveland

Furnaces and Ovens
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Furnaces, Tempering and Annealing
American Gas Furnace Co., Elizabeth
Brown & Sharpe Mfg. Co., Providence
Chicago (Ill.) Flexible Shaft Co.
General Electric Co., Schenectady
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Strong Carlisle & Hammond Co., Cleveland

Furniture, Machine Shop
Armstrong Bros. Tool Co., Chicago
Brown Eng. Co., Reading
New Britain (Conn.) Machine Co.
Vitek Mfg. Co., Omaha, Neb.

Gage Blocks
Pratt & Whitney Co., Hartford

Gages, Comparator
Federal Products Corp., Providence
Jones & Lamson Mch. Co., Springfield, Vt.

Gages, Dial
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Starrett Co., L. S., Athol, Mass.

Gages, Plug and Ring
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford

Gages, Recording
Bristol Co., Waterbury
Brown Instrument Co., Phila.

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Federal Prod. Corp., Providence
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Co., Hartford
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Gages, Standard
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Greenfield (Mass.) Tap & Die Corp.
Hartford (Conn.) Special Mchy. Co.
Pratt & Whitney Co., Hartford

Gear Cutting Machinery
Adams Co., Dubuque, Iowa
Barber-Colman Co., Rockford
Bilgram Machine Works, Phila.
Bilton Machine Tool Co., Bridgeport
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mch. Co.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co. (The) Nashua, N. H.
Gleason Works, Rochester
Gould & Eberhardt, Newark, N. J.
Harrington Co., Phila.
Lees Bradner Co., Cleveland
Newark (N. J.) Gear Cut Mch. Co.
Schuchardt & Schutte (Geo. Scherr), N. Y.
Wade Tool Co., Waltham
Waltham (Mass.) Mach. Wks.
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Adams Co., Dubuque, Iowa
Brown & Sharpe Mfg. Co., Providence
Gleason Works, Rochester
Lees Bradner Co., Cleveland
Newark (N. J.) Gear Cut. Mch. Co.
Scherr, George, New York

Gears, Cast
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Caldwell & Son Co., H. W., Chicago
Cleveland (O.) Worm Gear Co.
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago-Phila.
Pennsylvania Gear & Machine Co., Phila.
Philadelphia (Pa.) Gear Works

Gears, Cut
Adams Co., Dubuque, Iowa
Albaugh-Dover Co., Chicago
Bilgram Machine Works, Phila.
Boston Gear Wks., Quincy
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Cincinnati (O.) Gear Co.
Cleveland (O.) Worm Gear Co.
Diefendorf Gear Corp., Syracuse
Earle Gear & Mch. Co., Philadelphia
Fawcus Machine Co., Pittsburgh.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co. (The), Nashua, N. H.
Foote Bros. Gear & Mach. Co. Chicago
Franklin Die Casting Corp., Syracuse
General Electric Co., Schenectady
Gleason Works, Rochester
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
James Mfg. Co., D. O., Chicago
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago-Phila.
Meisel Press Mfg. Co., Boston
Newark (N. J.) Gear Cutting Mch. Co.
Niles-Bement-Pond, N. Y.
Pennsylvania Gear & Machine Co., Phila.
Philadelphia (Pa.) Gear Works
Simonds Mfg. Co., Pittsburgh

Gears, Forged
Philadelphia (Pa.) Gear Wks.

Gears, Speed Reducer
Boston Gear Wks., Quincy, Mass.
Cleveland (Ohio) Worm & Gear Co.
Foote Bros. Gear & Mach. Co., Chicago
James Mfg. Co., D. O., Chicago
Niles-Bement-Pond, N. Y.

Generators, Acetylene
Oxweld Acetylene Co., Long Island City, N. Y.

Generators, Electric
General Electric Co., Schenectady
Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Grab Buckets
Link-Belt Co., Chicago-Phila.

Greases, Lubricating
White & Bagley Co., Worcester

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Bench
Brown & Sharpe Mfg. Co., Providence
Clark Electric Co., Jas., Jr., Louisville
Diamond Mach. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
Haskins Co., R. G., Chicago
Norton Co., Worcester
Ryerson & Son, Jos. T., Chicago
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester

Grinding Machines Centerless
Cincinnati (O.) Milling Mach. Co.

Grinding Machines, Chaser
Geometric Tool Co., New Haven
National Acme Co., Cleveland

Grinding Machines, Chucking
Blanchard Mach. Co., Cambridge
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford
Barnes Co., W. F. & John, Rockford
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Diamond Mach. Co., Providence
Fafnir Bearing Co., New Britain
Gallmeyer & Livingston Co., Grand Rapids
Greenfield (Mass.) Tap & Die Corp.
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
LeBlond Mach. Tool Co., R. K., Cincinnati
Norton Co., Worcester
Oesterlein Machine Co., Cincinnati
Reed-Prentice Co., Worcester
Sellers & Co., Wm., Philadelphia
Taylor & Fenn Co., Hartford
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati (O.) Grinder Co.
Cons. Mach. Tool Corp., Rochester
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Norton Co., Worcester
Oesterlein Machine Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester

Grinding Machines, Die
Abrasive Mch. T. Co., E. Providence
Bignall & Keeler Mach. Wks., Edwardsville, Ind.
Blanchard Mach. Co., Cambridge
Diamond Mach. Co., Providence
Geometric Tool Co., New Haven
Heald Machine Co., Worcester
Landis Machine Co., Waynesboro
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Machinery Co., Tiffin
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Disc
Diamond Mach. Co., Providence
Rowbottom Mach. Co., Waterbury

Grinding Machines, Drill and Tap
Gallmeyer & Livingston Co., Grand Rapids
Sellers & Co., Wm., Philadelphia
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Face or Ring Wheel
Abrasive Mch. T. Co., E. Providence
Blanchard Mach. Co., Cambridge
Diamond Mach. Co., Providence
Graham Mfg. Co., Providence
Walker Co., O. S., Worcester

Grinding Machines, Floor
Brown & Sharpe Mfg. Co., Providence
Diamond Mach. Co., Providence
Norton Co., Worcester
Ryerson & Son, Jos. T., Chicago

Grinding Machines, Gage
Abrasive Mch. T. Co., E. Providence
Landis Tool Co., Waynesboro
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Gear
Lees Bradner Co., Cleveland

Grinding Machines, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati (O.) Grinder Co.
Greenfield (Mass.) Tap & Die Corp.
Heald Mach. Co., Worcester
Hjorth Lathe & Tool Co., Boston
Landis Tool Co. Waynesboro
Micro Machine Co., Bittendorf, Iowa
Rivett Lathe & Grinder Corp., Boston
Thompson Grinder Co., Springfield, Ohio
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Baltimore
Buckeye Portable Tool Co., Dayton
Chicago Pneumatic Tool Co., N. Y.
Clark Electric Co., Jas., Jr., Louisville
Haskins Co., R. G., Chicago
Ingersoll-Rand Co., N. Y.
Wisconsin Elec. Co., Racine
White Mfg. Co., S. S., N. Y.

Grinding Machines, Pulley
Graham Mfg. Co., Providence

Grinding Machines, Radial
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Snagging
Diamond Mach. Co., Providence

Grinding Machines, Surface
Abrasive Mch. T. Co., E. Providence
Blanchard Mach. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
Diamond Mach. Co., Providence
Heald Mach. Co., Worcester
Norton Co., Worcester
Pratt & Whitney Co., Hartford
Rowbottom Mach. Co., Waterbury
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.
Cincinnati (O.) Grinder Co.
Gallmeyer & Livingston Co., Grand Rapids
Gisholt Mch. Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
Landis Tool Co., Waynesboro
Norton Co., Worcester
Thompson Grinder Co., Springfield, Ohio
Wilmarth & Morman Co., Grand Rapids

Grinding Wheels
Norton Co., Worcester

Hammers, Drop
Niles-Bement-Pond, N. Y.

Hammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.

Hammers, Power
Bliss Co., E. W., Brooklyn
Ryerson & Son, Joseph T., Chicago

Hammers, Soft Metal
Bilton Machine Tool Co., Bridgeport

Hammers, Steam
Niles-Bement-Pond, N. Y.

Handles, Machine
Rockwood Sprinkler Co., Worcester

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence
Fafnir Bearing Co., New Britain
Hyatt Roller Bearing Co., Newark, N. J.
Jones Fdry. & Machine Co., W. A. Chicago

Hardness Testing Apparatus
Shore Instrument & Mfg. Co. Jamaica, N. Y.

Madison-Kipp Fresh Oil System
as applied to The Smith & Mills Shaper

Because they are tool-room machines, Shapers must be so designed that they are and stay accurate.

When the Smith & Mills Company were looking for ways to make their Shaper still better, one of the first things they attached was the lubrication of the ways.

They wanted to find a method that would provide constant lubrication without being dependent on the operator.

They found that the new Madison-Kipp machine tool lubricator could be regulated to feed ***automatically*** just the right amount of fresh oil to the ways.

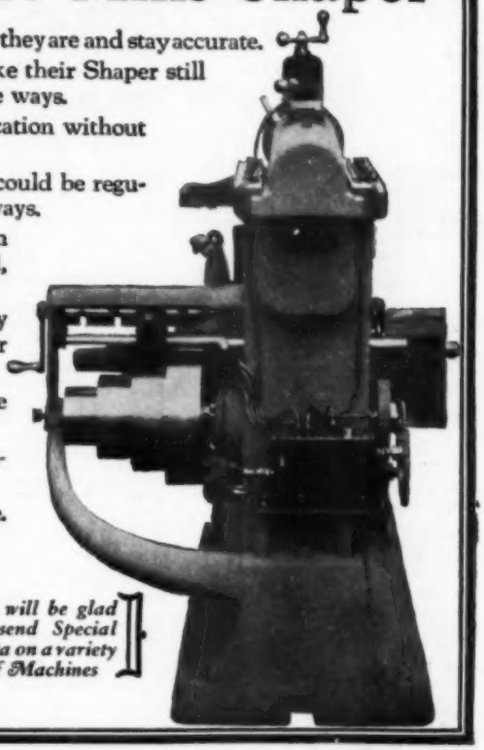
Because if it is ***fresh oil***, it provides the unbroken protecting film that no used oil can offer. Because the supply is properly regulated, there is no waste.

In the course of their usual thorough tests, they found that they could use additional feeds to lubricate interior parts that the operator could reach only with difficulty.

The Madison-Kipp machine tool lubricator may now be had on the Smith & Mills Shaper, as on so many other machine tools.

Madison-Kipp machine tool lubricators are flexible as to size, oil-feed adjustment, type and drive location.

In many cases, they can be installed on machine tools now in use.



Lubrication Specialists Since 1898

Madison-Kipp Corporation

Madison, Wisconsin, U. S. A.

MADISON-KIPP LUBRICATORS

We will be glad to send Special Data on a variety of Machines

AMERICAN SWISS

ONLY FILES THE BEST TOOLS ARE GOOD ENOUGH TRADE MARK

Trade Mark on every file

Performance on Tough Jobs is the Gage

The only way to test a file's quality is to test it on file-killing work. Will it stand up? How long will it "bite"?

American Swiss Files invite that kind of a test in any company. It is the best way to bring out values—American Swiss values.

AMERICAN SWISS FILES

American Swiss File & Tool Co.

410-416 Trumbull St., Elizabeth, New Jersey

Hobbing Machines
Adams Co., Dubuque, Iowa
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mch. Co.
Gould & Eberhardt, Newark, N. J.
Newark (N. J.) Gear Cutting Mch. Co.
Schuchardt & Schutte (Geo. Scherr) N. Y.
Sommers & Adams Co., Cleveland

Hobs
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Newark (N. J.) Gear Cutting Mch. Co.
Philadelphia (Pa.) Gear Wks.
Union Twist Drill Co., Athol, Mass.

Hoists and Cranes, Electric and Traveling
American Eng. Co., Philadelphia
Elwell-Parker Electric Co., Cleveland
General Electric Co., Schenectady
Harrington Co., Phila.
Link-Belt Co., Chicago-Phila.
Niles-Bement-Pond, N. Y.

Hoists, Hand
Ford Chain Block Co., Phila.
Harrington Co., Phila.

Hoists, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.
Sullivan Mchy Co., Chicago

Holders-on, Pneumatic
Chicago Pneumatic Tool Co., N. Y.

Hydraulic Machinery
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Veeder Mfg. Co., Hartford

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago

Jig Bushings
Ex-Cell-O Tool & Mfg. Co., Detroit

Jigs and Fixtures (See Contract Work)

Joints, Universal
Blood Bros. Machine Co., Allegan, Mich.
Boston Gear Wks., Norfolk Downs
Dexter Co., I. H., Goshen, N. Y.
Fox Mach. Co., Jackson, Mich.
Gray & Prior Mach. Co., Hartford
Nat'l Auto Tool Co., Richmond

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence
Gray & Prior Mach. Co., Hartford

Keyseating Machines
Baker Bros., Toledo
Davis Keyseater Co., Rochester
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson, Mass.
Mitts & Merrill, Saginaw.
Morton Mfg. Co., Muskegon Heights

Keys, Machine
Morton Mfg. Co., Muskegon Heights
Whitney Mfg. Co., Hartford

Lamps, Electric
General Electric Co., Schenectady

Lapping Machines, Cylindrical and Flat
Bethel-Player Co., Westboro, Mass.

Lathe Attachments
Ames Co., B. C., Waltham
Dalton Tool Corp., N. Y.
Flather Co. (The) Nashua, N. H.

Lathe Tools
Armstrong Bros. Tool Co., Chicago
O. K. Tool Co., Shelton, Conn.

Lathes, Automatic and Semi-Automatic
Gisholt Mch. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Potter & Johnston Mch. Co., Pawtucket
Pratt & Whitney Co., Hartford
Reed-Prentice Co., Worcester
Seneca Falls (N. Y.) Machine Co.
South Bend (Ind.) Lathe Wks.
Steinle Turret Mach. Co., Madison, Wis.

Lathes, Bench
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Dalton Tool Corp., N. Y.
Diamond Machine Co., Providence
Hardinge Bros., Chicago
Hjorth Lathe & Tool Co., Boston
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Corp., Boston
Seneca Falls (N. Y.) Machine Co.
South Bend (Ind.) Lathe Wks.
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass
Wade Tool Co., Waltham

Lathes, Boring
Potter & Johnston Mch. Co., Pawtucket, R. I.
Rockford (Ill.) Tool Co.

Lathes, Chucking (See Lathes, Horizontal and Vertical Turret)

Lathes, Engine
Acme Mach. Tool Co., Cincinnati
American Tool Wks. Co., Cincinnati
Barnes Co., W. F. & John, Rockford
Boye & Emmes Mach. Tool Co., Cincinnati
Bradford Mach. Tool Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Dalton Tool Corp., N. Y.
Flather Co. (The) Nashua, N. H.
Greaves, Klusman T. Co., Cincinnati
LeBlond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Mach. Tool Co., Sidney, O.
Morris Machine Tool Co., Cincinnati
Mueller Mach. Tool Co., Cincinnati
Niles-Bement-Pond, N. Y.
Pratt & Whitney Co., Hartford
Reed-Prentice Co., Worcester
Rockford (Ill.) Tool Co.
Ryerson & Son, Joseph T., Chicago
Seneca Falls (N. Y.) Machine Co.
Springfield (O.) Mch. T. Co.
South Bend (Ind.) Lathe Wks.
Wickes Bros., Saginaw

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
Harrington Co., Phila.

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford
Dalton Tool Corp., N. Y.
Seneca Falls (N. Y.) Machine Co.

Lathes, Fox
Bardons & Oliver, Cleveland

Lathes, Gap
South Bend (Ind.) Lathe Wks.

Lathes, Horizontal and Vertical Turret
Acme Machine Tool Co., Cincinnati
Bullard Mach. Tool Co., Bridgeport
Dreses Mch. Tool Co., Cincinnati
Gisholt Mch. Co., Madison, Wis.
International Mach. Tool Co., Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Niles-Bement-Pond, N. Y.
Pratt & Whitney Co., Hartford
Steinle Turret Mach. Co., Madison, Wis.
Warner & Swasey Co., Cleveland

Lathes, Polishing (See Polishing and Buffing)

Lathes, Spinning
Adriance Mach. Wks., Brooklyn

Lathes, Toolroom
Hardinge Bros., Chicago
Pratt & Whitney Co., Hartford
Rockford (Ill.) Tool Co.

Lathes, Wood Turning
Barnes Co., W. F., & John, Rockford
Seneca Falls (N. Y.) Machine Co.

Letters and Figures
Brown & Sharpe Mfg. Co., Providence
Hoggson & Pettis Mfg. Co., New Haven

Level Precision Machines, Aligning
Pratt & Whitney Co., Hartford
Universal Bor. Mch. Co., Hudson, Mass.

Lighting Fixtures
General Electric Co., Schenectady

Lining Brake & Clutch
Raybestos Co., Bridgeport

Lubricants
Oakley Chemical Co., N. Y.
White & Bagley Co., Worcester

Lubricating Systems
Bowser & Co., S. F., Fort Wayne, Ind.
Madison-Kipp Corp., Madison, Wis.

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Nicholson & Co., W. H., Wilkes-Barre
Pratt & Whitney Co., Hartford

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
Cleveland (O.) Twist Drill Co.
Nicholson & Co., W. H., Wilkes-Barre
Union Twist Drill Co., Athol, Mass.

Marking Machines
Hjorth Lathe & Tool Co., Boston
Noble & Westbrook Mfg. Co., Hartford.

Measuring Machines
Bethel-Player Co., Westboro, Mass.
Pratt & Whitney Co., Hartford
Schuchardt & Schutte (Geo. Scherr) N. Y.

Metal
Stockbridge Mach. Co., Worcester

Metal Cleaning Equipment
Colts Patent Fire Arms Mfg. Co., Hartford

Meters, Steam Flow
General Electric Co., Schenectady

Micrometers, Bench
Pratt & Whitney Co., Hartford
Starrett Co., L. S., Athol, Mass.

Micrometer Calipers
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Milling Attachments
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Ingersoll Milling Mach. Co., Rockford
Kearney & Trecker, Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mach. Tool Co., R. K., Cincinnati
Oesterlein Machine Co., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Rockford (Ill.) Milling Machine Co.
South Bend (Ind.) Lathe Wks.
Whitney Mfg. Co., Hartford

Milling Machines, Automatic
Bilton Machine Tool Co., Bridgeport
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford
Pratt & Whitney Co., Hartford
Rockford (Ill.) Milling Machine Co.

Milling Machines, Bench
Ames Co., B. C., Waltham
Hardinge Bros., Chicago
Pratt & Whitney Co., Hartford
Rockford (Ill.) Milling Machine Co.
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Continuous
Bilton Mach. Tool Co., Bridgeport, Conn.
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill Mch. Co., Rockford
Potter & Johnston Mch. Co., Pawtucket
Rockford (Ill.) Milling Machine Co.

Milling Machines, Duplex
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford
Knight Mchy. Co., W. B., St. Louis
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines for Planers
Adams Co., Dubuque, Iowa

Milling Machines, Hand
Adams Co., Dubuque, Iowa
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Kempsmith Mfg. Co., Milwaukee
Pratt & Whitney Co., Hartford
Rockford (Ill.) Milling Machine Co.
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass
Whitney Mfg. Co., Hartford

Milling Machines, Horizontal and Planer Type
Cons. Mach. Tool Corp., Rochester
Ingersoll Milling Mch. Co., Rockford
Niles-Bement-Pond, N. Y.

Milling Machines, Plain
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mach. Tool Co., R. K., Cincinnati
Oesterlein Machine Co., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Rockford (Ill.) Milling Mach. Co.
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Portable
Ingersoll Mill Mch. Co., Rockford
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Bilton Machine Tool Co., Bridgeport
Hall Planetary Thread Milling Mch. Co., Philadelphia
Harrington Co., Phila.
Lees Bradner Co., Cleveland
Pratt & Whitney Co., Hartford
Taft-Peirce Mfg. Co., Woonsocket
Waltham (Mass.) Mach. Wks.

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mach. T. Co., R. K., Cincinnati
Oesterlein Machine Co., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Rockford (Ill.) Milling Machine Co.
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cons. Mach. Tool Corp., Rochester
Ingersoll Milling Mach. Co., Rockford
Kearney & Trecker, Milwaukee
Kempsmith Mfg. Co., Milwaukee
Knight Mchy. Co., W. B., St. Louis
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond, N. Y.
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Rockford (Ill.) Milling Machine Co.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Worm
Bilton Machine Tool Co., Bridgeport
Pratt & Whitney Co., Hartford
Waltham (Mass.) Mach. Wks.

Milling Tools, Adjustable, Hollow
Geometric Tool Co., New Haven

Monel Metal
International Nickel Co., N. Y.

Motors, Electric
Burke Elect. Co., Erie
General Electric Co., Schenectady
Lincoln Electric Co., Cleveland
Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wisconsin Elec. Co., Racine

Nickel
International Nickel Co., N. Y.

Numbering Machines
Noble & Westbrook Mfg. Co., Hartford

Nut Facing Machines
Landis Machine Co., Waynesboro

Nut Tappers (See Bolt and Nut Machinery)

Oil and Grease Cups
Bay State Stamping Co., Worcester
Berry Auto Lubricator Co., N. Y.
Gits Bros. Mfg. Co., Chicago
Smith Co., Malcolm H., Boston

Oil Filtering and Storage Systems
Bowser & Co., S. F., Ft. Wayne, Ind.

Oil Grooving Machines
Fischer Machine Co., Phila.

Oil Stones
Norton Co., Worcester

Oils
(See Lubricants)

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It is no more important to audit your books, about now, than to audit your oil storage system—or lack of it, as the case may be!

Oil costs money—won't cost less in 1926. But lack of oil—that's what costs most, in burned-out bearings, in shut-downs, in men's time wasted and lost.

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Bowser engineers will, without obligation, tell and show you how to store oil right. To enlist their assistance, address Dept. 1, please.

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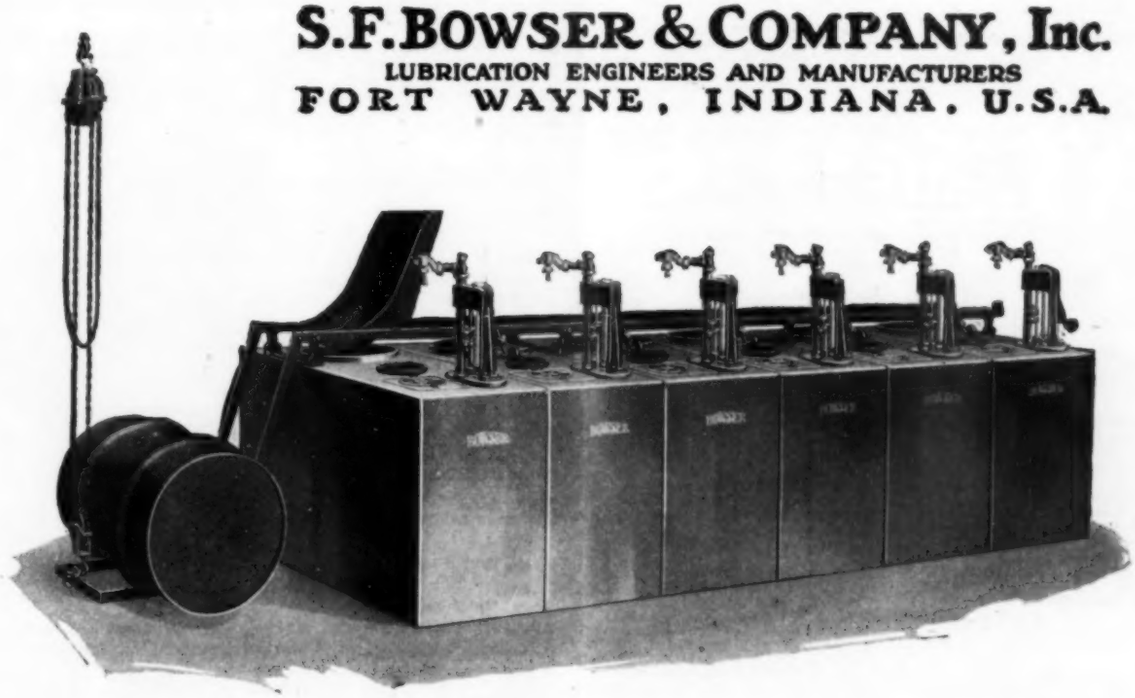
FORT WAYNE, INDIANA, U.S.A.



Parallels
Starrett Co., L. S., Athol, Mass.

Pattern Shop Machinery
(See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mach. Tool & Die Co., Roselle.

Pipe Bending Machines
Harrington Co., Phila.
Underwood Corp., H. B., Phila.

Pipe Cutting and Threading Machines
Bignall & Keeler Mach. Wks., Edwardsville, Ind.
Greenfield (Mass.) Tap & Die Corp.
Harrington Co., Phila.
Landis Mach. Co., Waynesboro
Merrell Mfg. Co., Toledo
Murchey Mach. & Tool Co., Detroit
Niles-Bement-Pond, N. Y.
Ryerson & Son, Jos. T., Chicago
Saunders Sons, D., Yonkers, N. Y.
Williams Tool Corp., Erie

Pipe Fitters' Tools
Butterfield & Co., Derby Line, Vt.
Cleveland (O.) Twist Drill Co.
Greenfield (Mass.) Tap & Die Corp.

Pipe, Brass
Bridgeport (Conn.) Brass Co.

Piston Ring Machines
National Acme Co., Windsor, Vt.
Potter & Johnston Mch. Co., Pawtucket

Planers, Crank
Cincinnati (O.) Gear Cutting Mch. Co.
Cincinnati (O.) Shaper Co.

Planing Machines
American Tool Wks. Co., Cincinnati
Cincinnati (O.) Planer Co.
Cleveland (O.) Planer Co.
Cons. Mach. Tool Corp., Rochester
Gray Co., G. A., Cincinnati
Liberty Machine Tool Co., Hamilton, Ohio
Niles-Bement-Pond, N. Y.
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

Planing Machines, Rotary
Cleveland (O.) Punch & Shear Wks. Co.
Liberty Machine Tool Co., Hamilton, Ohio
Underwood Corp., H. B., Phila.

Plate Rolls
Cleveland (O.) Punch & Shear Wks. Co.

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Buckeye Portable Tool Co., Dayton
Chicago Pneumatic Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford
Blanchard Mach. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
Bryant Chucking Grinder Co., Springfield, Vt.
Diamond Mach. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
New Britain (Conn.) Machine Co.
Rowbottom Mach. Co., Waterbury
Union Twist Drill Co., Athol, Mass.
U. S. Electrical Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.
Wisconsin Elec. Co., Racine

Press Feeds
Littell Mach. Co., F. J., Chicago

Presses, Arbor
Barnes Co., W. F. & John, Rockford
Nicholson & Co., W. H., Wilkes-Barre

Presses, Drop and Forging
Bliss Co., E. W., Brooklyn
Niagara Machine & Tool Wks., Buffalo
Toledo (O.) Mach. & Tool Co.

Presses, Foot and Hand
Adriance Mach. Wks., Inc., Brooklyn
Bliss Co., E. W., Brooklyn
Niagara Mach. & Tool Wks., Buffalo
Taylor & Fenn Co., Hartford

Presses, Forcing
Barnes Co., W. F. & John, Rockford
Elmes Eng. Wks., Chas. F., Chicago
Lucas Mach. Tool Co., Cleveland

Presses, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Oilgear Co., Milwaukee
Watson-Stillman Co., N. Y.

Presses, Power
Adriance Mach. Wks., Brooklyn
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Fox Mach. Co., Jackson, Mich.
Niagara Mach. & Tool Wks., Buffalo
Rowbottom Mach. Co., Waterbury
Toledo (O.) Mach. & Tool Co.
V&O Press Co., Hudson, N. Y.

Presses, Screw
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn

Profiling Machines
Fischer Machine Co., Phila.
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham

Pulley Turning and Boring Machines
American Tool Wks. Co., Cincinnati

Pulleys, Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co., H. W., Chicago
Johnson Mach. Co., Carlyle, Manchester, Conn.
Jones Fdry. & Machine Co., W. A., Chicago

Pumps, Centrifugal
Ingersoll-Rand Co., N. Y.

Pumps, Hydraulic
Elmes Eng. Wks., Chas F., Chicago
Oilgear Co., Milwaukee

Pumps, Lubricant and Oil
Bowser & Co., S. F., Ft. Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence
Fulflo Specialties Co., Blanchester, Ohio

Pumps, Power
Ingersoll-Rand Co., N. Y.
Sullivan Mchy. Co., Chicago

Pumps, Steam
Ingersoll-Rand Co., N. Y.

Pumps, Vacuum
Ingersoll-Rand Co., N. Y.

Punches, Center
Birdsboro (Pa.) Steel Fdry. & Mach. Co.
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Punches and Dies
Pratt & Whitney Co., Hartford

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago

Punches, Power
Bowser & Co., S. F., Ft. Wayne, Ind.
Buffalo (N. Y.) Forge Co.
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, O.
Mitts & Merrill, Saginaw
Niagara Mach. & Tool Wks., Buffalo
Pels & Co., Henry, N. Y.
Ryerson & Sons, Joseph T., Chicago
Watson-Stillman Co., N. Y.

Punching and Shearing Machines
Cons. Mach. Tool Corp., Rochester

Pyrometers, Electric
Bristol Co., Waterbury.
Brown Inst. Co., Philadelphia

Rack Cutting Machines
Newark (N. J.) Gear Cutting Mch. Co.

Racks, Cut
Boston Gear Wks., Quincy, Mass.
Meisel Press Mfg. Co., Boston
Foote Bros. Gear & Mach. Co., Chicago

Racks, Storage (See Furniture, Machine Shop)

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y

Reamer Holders
Landis Machine Co., Waynesboro
McCrosky Tool Corp., Meadville, Pa.
Nicholson & Co., W. H., Wilkes-Barre

Reamers, Adjustable
Brubaker & Bros. Co., W. L., N. Y.
Cleveland (O.) Twist Drill Co.
Gisholt Mch. Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
McCrosky Tool Corp., Meadville
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Taft-Peirce Mfg. Co., Woonsocket

Reamers, Solid
Brubaker & Bros. Co., W. L., N. Y.
Buckeye Twist Drill Co., Alliance
Butterfield & Co., Derby Line, Vt.
Cleveland (O.) Twist Drill Co.
Gammons-Holman Co., Manchester, Conn.
Greenfield (Mass.) Tap & Die Corp.
Hjorth Lathe & Tool Co., Boston
Morse Twist D.& M. Co., New Bedford
National Tool Co., Cleveland
Pratt & Whitney Co., Hartford
Reed Mfg. Co., Erie
Threadwell Tool Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.

Reamers, Taper
Brown & Sharpe Mfg. Co., Providence
Gammons-Holman Co., Manchester, Conn.
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol, Mass.

Recorders, Pressure
Bristol Co., Waterbury
Brown Inst. Co., Philadelphia

Recorders, Temperature
Bristol Co., Waterbury

Rheostats
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Rivet, Heating
American Gas Furnace Co., Elizabeth
National Equipment Co., Springfield, Mass.

Rivet Making Machinery
National Machinery Co., Tiffin

Rivet Sets
Chicago Pneumatic Tool Co., N. Y.
Hunter Saw & Mch. Co., Pittsburgh

Riveting Machines
Birdsboro (Pa.) Steel Fdry. & Mach. Co.
Chicago Pneumatic Tool Co., N. Y.
Grant Mfg. & Machine Co., Bridgeport
National Equipment Co., Springfield, Mass.
Ryerson & Son, Jos. T., Chicago

Rules, Steel & Wood
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Rust Preventatives
Oakley Chemical Co., N. Y.

Safety Guards
Dickgriesser & Co., Chas. J., Derby, Conn.

Sand Blast Apparatus
Pangborn Corp., Hagerstown, Md.

Sand Rammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.

Saw Frames and Blades
American Saw & Mfg. Co., Springfield, Mass.
Diamond S. & Stamp Wks., Buffalo
Starrett Co., L. S., Athol, Mass.
Thompson & Son Co., Henry G., New Haven

Saw Sharpening Machines
Hunter Saw & Mch. Co., Pittsburgh

Saw Tables, Universal
Silver Mfg. Co., Salem, Ohio

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago.
Birdsboro (Pa.) Steel Fdry. & Mach. Co.
Diamond S. & Stamp Wks., Buffalo
Earle Gear & Machine Co., Phila.
Greenfield (Mass.) Tap & Die Corp.
Peerless Machine Co., Racine
Stockbridge Mach. Co., Worcester

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago.
Diamond S. & Stamp Wks., Buffalo
Peerless Machine Co., Racine
Stockbridge Mach. Co., Worcester

Saws, Band
Thompson & Son Co., Henry G., New Haven

Saws, High Speed
Ryerson & Son, Jos. T., Chicago

Saws, Metal Cutting
American Saw & Mfg. Co., Springfield, Mass.
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Hunter Saw & Mch. Co., Pittsburgh
Silver Mfg. Co., Salem, Ohio
Union Twist Drill Co., Athol, Mass.

Saws, Milling
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.

Saws, Screw Slotting
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

Scales
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Scraping Machines, Metal
Anderson Bros. Mfg. Co., Rockford

Screw Driving Machinery
Reynolds Machine Co., Massillon, O.

Screw-Machine Work
Eastern Mch. Screw Corp., New Haven
Link-Belt Co., Chicago-Phila.
Morris Machine Tool Co., Cincinnati
National Acme Co., Cleveland
New Britain (Conn.) Machine Co.

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cone Auto. Mch. Co., Windsor, Vt.
National Acme Co., Cleveland
New Britain (Conn.) Machine Co.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Dreses Mch. Tool Co., Cincinnati
Gisholt Machine Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Co., Hartford
Warner & Swasey Co., Cleveland

Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, O.
Carpenter Tap & Die Co., J. M., Pawtucket
Greenfield (Mass.) Tap & Die Corp.
Morse Twist D & M. Co., New Bedford
Pratt & Whitney Co., Hartford
Threadwell Tool Co., Greenfield, Mass.

Screws, Cap and Set
Allen Mfg. Co., Hartford
Bristol Co., Waterbury.
Eastern Mch. Screw Corp., New Haven
National Acme Co., Cleveland

Screws, Machine
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Eastern Mch. Screw Corp., New Haven

Screws, Safety Set (See Screws, Cap and Set)

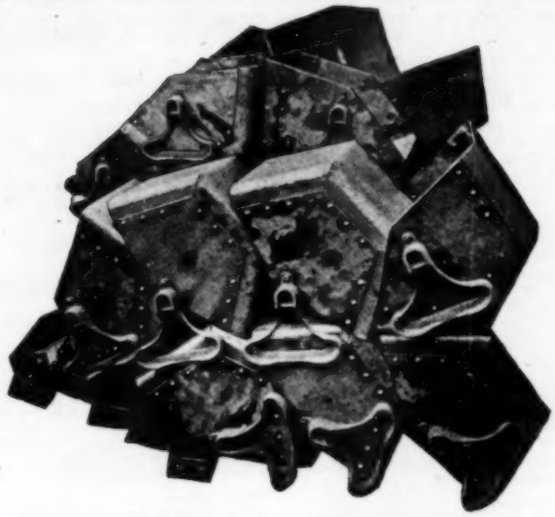
Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery
(See Searchlight Section)
Allen Co., Inc., H. F., Inc.
Beal & Co., Jos., Boston
Botivinik Bros., New Haven, Conn.
Brownell Machinery Co., Providence
Emerman & Co., Louis E., Chicago
Essley, E. L., Mchy. Co., Chicago
Hill, Clarke & Co., Chicago
Hill, Clarke & Co., Inc., Boston
Hyman & Son, Jos., Phila.
Ideal Mchy. Co., Plainsville, Conn.
Lamberg & Co., A., N. Y.
Land, L. J., N. Y.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Lynd-Farquhar Co., Boston
Miles Mchy. Co., Saginaw
Morey & Co., N. Y.
Moyer, J. N., Phila.
Mueller Mach. Tool Co., Cincinnati
Niles & Co., F. H., N. Y.
Niles-Bement-Pond, N. Y.
Noble Mchy. Co., N. Y.
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Richey-Whaley Machy. Co., Indianapolis
Russell Machine Co., Phila.
Ryerson & Son, Jos. T., Chicago
Simmons Mach. Tool Corp., Albany
Strong, Carlisle & Hammond Co., Cleveland
Wayne Machy. Co., Ft. Wayne, Ind.
Wickes Mchy. Co., Jersey City, N. J.

Separators, Oil and Waste
Barrett, Leon J., Worcester

Shaft, Hangers, Pressed Steel
American Pulley Co., Philadelphia

Shafting
Hawkridge Bros. Co., Boston
Lancaster (Pa.) Steel Products Corp.



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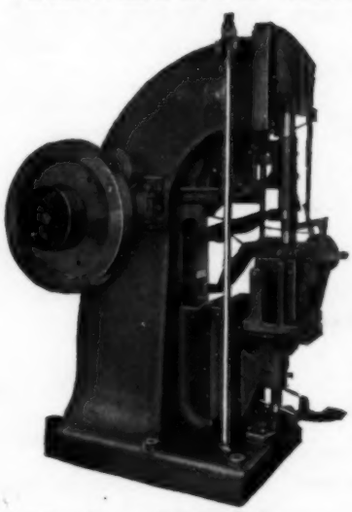
Picture the heavy duty work required of these steel conveyor buckets. Cold riveting would not last—hot riveting too slow and costly a process.

One KOBERT machine and one man eliminated a Four Man Gang and doubled the production—and with hot riveting.

Kobert

ELECTRIC RIVETING MACHINES



This is an actual example of the big savings being effected by the installation of KOBERT ELECTRIC RIVETERS.

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National Equipment Company
Kobert Division
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Haskins Co., R. G., Chicago
Strand & Co., N. A., Chicago
White Mfg. Co., S. S., N. Y.

Shapers, Vertical
Pratt & Whitney Co., Hartford

Shapes, Cold Drawn Special Steel
Union Drawn Steel Co., Beaver Falls, Pa.

Shaping Machines
American Tool Wks. Co., Cincinnati
Cincinnati (O.) Gear Cutting Mch. Co.
Cincinnati (O.) Shaper Co.
Gould & Eberhardt, Newark, N. J.
Kelly Co., R. A., Xenia, Ohio
Morton Mfg. Co., Muskegon Heights
Niles-Bement-Pond, N. Y.
Ohio Machine Tool Co., Kenton
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Smith & Mills Co., Cincinnati
Springfield (O.) Mch.-T. Co.
Stockbridge Machine Co., Worcester
Steel Prod. Eng. Co., Springfield, O.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago

Shears, Power
Adriance Mach Wks., Brooklyn
Birdsboro (Pa.) Steel Fdry. & Mach. Co.
Buffalo (N. Y.) Forge Co.
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, O.
Mitts & Merrill, Saginaw
Niagara Mch. & Tool Wks., Buffalo
Pels & Co., Henry, N. Y.
Ryerson & Son, Jos. T., Chicago
Toledo (O.) Mach. & Tool Co.
Unishear Co., N. Y.

Sheet Metal Working Machinery
Adriance Mach Wks., Brooklyn
Bliss Co., E. W., Brooklyn
Cincinnati (O.) Gear Cutting Mch. Co.
Cincinnati (O.) Shaper Co.
Niagara Mch. & Tool Wks., Buffalo
Ryerson & Son, Joseph T., Chicago
Toledo (O.) Mach. & Tool Co.
Unishear Co., N. Y.

Slotting Machines
Cons. Mach. Tool Corp., Rochester
National Acme Co., Cleveland
Niles-Bement-Pond, N. Y.
Sellers & Co., Wm., Philadelphia

Sockets and Sleeves
Cleveland (O.) Twist Drill Co.

Special Machinery and Tools (See Contract Work)

Speed Reducers
Albaugh-Dover Mfg. Co., Chicago
Boston Gear Wks., Norfolk Downs
Cleveland (O.) Worm & Gear Co.
Foote Bros. Gear & Mach. Co., Chicago
Jones Fdry. & Machine Co., W. A., Chicago
Philadelphia (Pa.) Gear Wks.

Spindles
Ex-Cell-O Tool & Mfg. Co., Detroit

Spring Winders
Hjorth Lathe & Tool Co., Boston

Sprockets and Chains
Bilgram Mach. Wks., Philadelphia
Boston Gear Wks., Quincy.
Cullman Wheel Co., Chicago
Grant Gear Wks., Boston
Link-Belt Co., Chicago-Phila.
Jones Fdry. & Machine Co., W. A., Chicago
Morse Chain Co., Ithaca
Philadelphia (Pa.) Gear Works
Ramsey Chain Co., Albany
Whitney Mfg. Co., Hartford

Squares
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Stampings, Metal
American Pulley Co., Philadelphia
Bay State Stamping Co., Worcester
Detroit (Mich.) Stamping Co.
Rockwood Sprinkler Co., Worcester

Stamps, Steel
Hoggson & Pettis Mfg. Co., New Haven
Noble & Westbrook Mfg. Co., Hartford

Stands, Portable (See Furniture, Machine Shop)
Steam Specialties
Dart Mfg. Co., E. M., Providence

Steel, Cold Drawn
Union Drawn Steel Co., Beaver Falls, N. Y.

Steel, Cold Rolled Strip
Carpenter Steel Co., Reading
Hawkridge Bros. Co., Boston
Lancaster (Pa.) Steel Prod. Corp.
Union Drawn Steel Co., Beaver Falls, N. Y.

Steel, Crucible
Carpenter Steel Co., Reading
Columbia Tool Steel Co., Chicago Heights
Crucible Steel Co. of Amer., N. Y.

Steel, Free Cutting Screw
Union Drawn Steel Co., Beaver Falls, N. Y.

Steel Hardness Measuring and Treating Instruments
Shore Instrument & Mfg. Co., Jamaica, N. Y.

Steel, Rustless and Stainless
Carpenter Steel Co., Reading
Firth-Sterling Steel Co., McKeesport, Pa.

Steel, Sheet
Hawkridge Bros. Co., Boston
Jessop & Sons, Wm., N. Y.
Ryerson & Son, Jos. T., Chicago

Steels, Alloy Carbon, and High Speed
Armstrong Bros. Tool Co., Chicago.
Carpenter Steel Co., Reading
Central Steel Co., Massillon, Ohio
Cleveland (O.) Twist Drill Co.
Columbia Tool Steel Co., Chicago Heights
Crucible Steel Co. of Amer., N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston
Jessop & Sons, Wm., N. Y.
Latrobe (Pa.) Electric Steel Co.
Ryerson & Son, Jos. T., Chicago
Vanadium Alloys Steel Co., Pittsburgh
Vulcan Crucible Steel Co., Aliquippa, Pa.
Western Tool & Mfg. Co., Springfield, O.

Stools, Shop (See Furniture, Machine Shop)

Straightening Machinery
Springfield (O.) Mch. T. Co.

Stud Setters, Self Opening
Geometric Tool Co., New Haven
McCrosky Tool Corp., Meadville, Pa.
Manufacturing Equip. Co., Anderson, Ind.

Subpresses and Dies
U. S. Tool Co., Ampere, N. J.
Waltham (Mass.) Mach. Wks.

Swaging Machines
Etna Mch. Co., Toledo
Langelier Mfg. Co., Cranston, R. I.
Torrington Co., Torrington, Conn.

Switches and Switchboards
General Electric Co., Schenectady
Hart & Hegeman Mfg. Co., Hartford
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Tachometers
Bristol Co., Waterbury

Tanks and Pumps, Oil
Bowser & Co., S. F., Ft. Wayne, Ind.

Tap Extensions
Allen Mfg. Co., Hartford

Tap Holders
Errington Mech. Laboratory, N. Y.
Greenfield (Mass.) Tap & Die Corp.
McCrosky Tool Corp., Meadville, Pa.

Taper Pins
Pratt & Whitney Co., Hartford

Tapes, Measuring
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Acme Machinery Co., Cleveland
Amer. Tool Wks. Co., Cincinnati
Ames Co., B. C., Waltham
Baker Bros., Toledo
Barber-Colman Co., Rockford
Barnes Drill Co., Inc., Rockford
Cincinnati (O.) Bickford Tool Co.
Errington Mechanical Lab., N. Y.
Fox Machine Co., Jackson, Mich.
Geometric Tool Co., New Haven, Ct.
Harrington Co., Phila.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Cranston, R. I.
McCrosky Tool Corp., Meadville, Pa.
Moline (Ill.) Tool Co.
Murchey Mach. & Tool Co., Detroit
Nat'l Automatic Tool Co., Richmond
National Machinery Co., Tiffin
Whitney Mfg. Co., Hartford

Taps and Dies
Brubaker & Bros Co., W. L., N. Y.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield.
Carpenter Tap & Die Co., J. M., Pawtucket
Greenfield (Mass.) Tap & Die Corp.
Landis Machine Co., Waynesboro
Morse Twist D. & M. Co., New Bedford
Murchey Mach. & Tool Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Co., Hartford
Threadwell Tool Co., Greenfield, Mass.

Taps, Collapsing
Cons. Mach. Tool Corp., Rochester
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Landis Machine Co., Waynesboro
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland

Tempering Compounds (See Case Hardening, etc.)

Thermometers
Bristol Co., Waterbury
Brown Inst. Co., Philadelphia

Thread-Cutting Tools
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
Pratt & Whitney Co., Hartford

Threading Machines
Automatic Mach. Co., Bridgeport
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Grant Mfg. & Mach. Co., Bridgeport
Greenfield (Mass.) Tap & Die Corp.
Hall Planetary Thread Mill Mch. Co., Philadelphia
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Machinery Co., Tiffin
Williams Tool Corp., Erie

Thread Rolling Machines
National Machinery Co., Tiffin

Tool Bits
Columbia Tool Steel Co., Chicago Heights
Firth-Sterling Steel Co., McKeesport, Pa.

Tool Holders
Armstrong Bros. Tool Co., Chicago
O. K. Tool Co., Shelton, Conn.

Tool Posts, Lathe
Armstrong Bros. Tool Co., Chicago
O. K. Tool Co., Shelton, Conn.

Tool Work (See Contract Work)

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Vises, Drilling Machine
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Hoggson & Pettis Mfg. Co., New Haven
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Fulton Drop Forge Co., Canal Fulton, Ohio
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Reed Mfg. Co., Erie

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Cincinnati (O.) Milling Mach. Co.
Greenfield (Mass.) Tap & Die Corp.
Hartford (Conn.) Special Mchy. Co.
Kempsmith Mfg. Co., Milwaukee
Reed-Prentice Co., Worcester
Whitney Mfg. Co., Hartford

Vises, Pipe
Butterfield & Co., Derby Line, Vt.
Greenfield (Mass.) Tap & Die Corp.
Reed Mfg. Co., Erie, Pa.

Vises, Planer and Shaper
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Vises, Universal Machine
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Hoggson & Pettis Mfg. Co., New Haven
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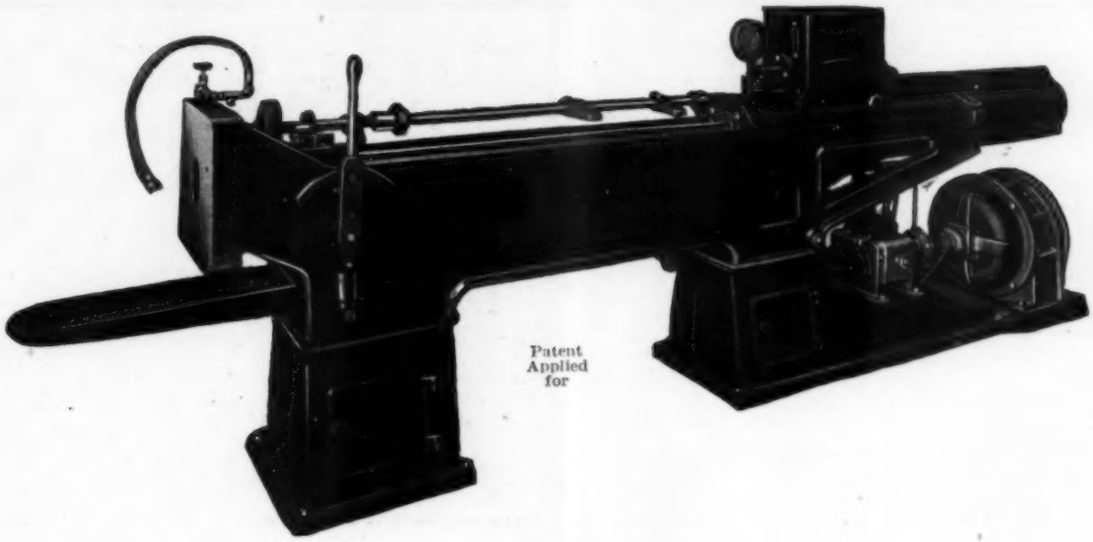

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